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# THE NAVAJO COUNTRY

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## PART I. PHYSICAL FEATURES*

### INTRODUCTION

The Navajo country, rich in historic and scenic interest, is a great mesa-dotted plateau stretching from the Rio Puerco westward to the Painted Desert region of the Little Colorado. Northward its desert wastes extend 140 miles to the San Juan River, where they break down into the picturesque canyon lands of southwestern Colorado (Fig. 1). It is the home of the Navajos, probably the most virile tribe of Indians in North America. It is by contrast the sunset land of the degenerate Hopi. Through it runs the trail of the early Spanish friars who crossed it when it was an unexplored and dangerous region. White settlements are all but wanting outside a few towns near the border. On the geological map of North America published in 1906 a large part of the Navajo country was left blank, for not even the most general outlines had been determined. Until the explorations of the last few years were carried out its canyons and volcanic mesas were virtually unknown to geography and rarely visited by even the trader. Yet its area is three times that of Massachusetts and a transcontinental railroad runs along its southern margin. It is one of the old-new spots of America; it is known about as well to-day as it was in the time of the venturesome padres; but in the long interval between it has remained an almost unexplored wilderness.

* Figs. 2, 3, 4 and 5 were drawn by Miss Gladys M. Wrigley, Research Assistant on the Society's staff.



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In the mind of the native tribes the Navajo country extends from San Francisco Mountain eastward to San Mateo. The northern boundary is an unpopulated zone of variable width, beyond which the Piutes have recognized rights; south of the Zuni Mountains is Apache-land, the home of the Navajo's cousin. That small groups of Hopis are included within his country is a matter of slight interest to the Navajo, since, in his opinion, the pueblos have no rights and their presence is a geographic accident.

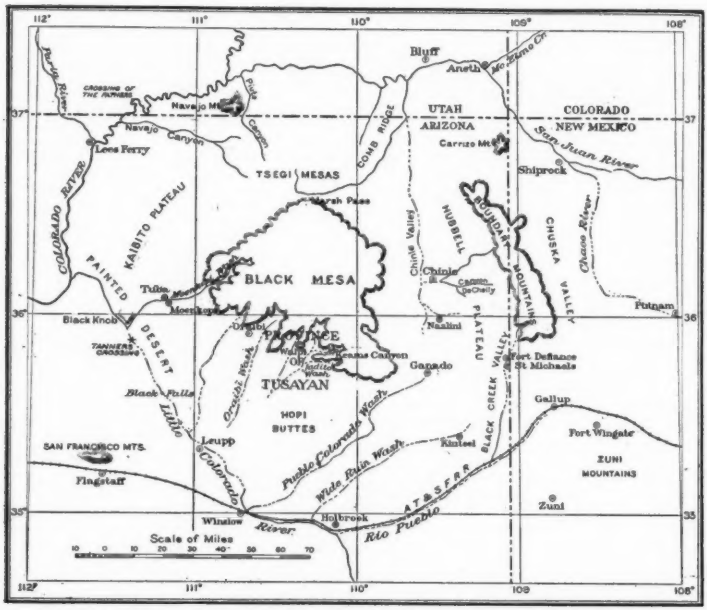


FIG. 1—Outline map of the Navajo country, based on reconnaissance maps of the United States Geological Survey and the United States Land Office, modified and supplemented by recent exploratory surveys. Scale, 1:3,700,000.

N.B.—"Rio Pueblo" should read "Rio Puerco."

The country thus vaguely outlined was made known to the civilized world by Don Pedro de Tovar and Friar Juan de Padilla, members of Coronado's expedition. Setting out from Zuni in July, 1540, these Spanish explorers discovered the Province of Tusayan, the site of the present Hopi villages. During the same summer Don Garcia Lopez de Cardeñas passed through the Hopi villages on his way to the "large river" of which he had heard. After twenty days' travel Cardeñas discovered the Canyon of the Colo-

rado. The exact point from which the river was first seen by white man cannot be determined, since Cardeñas had ample time to reach any spot along the middle Colorado, and the descriptions in the chronicles are applicable to many localities along a hundred-mile stretch of canyon rim. The expedition doubtless followed the ancient Hopi trail leading from Oraibi to the Havasupai villages; the routes indicated by Bancroft and by Winship are impracticable for horses and impossible for foot travelers without transporting a supply of water. The travels of Garces, 1768-1776, were largely through country previously explored by scouts of the Church, but the expedition of Escalante in 1776 crossed the Glen Canyon of the Colorado at the point designated on maps as the "Crossing of the Fathers." If this interpretation be correct, this intrepid priest should be credited with the most daring adventure of all the early explorers, for this route presents most formidable difficulties. The century following the exploits of Garces and Escalante has left little recorded history of Spanish missionary enterprise among the Navajo and Hopi. Only one book published during this period, viz.: Abbe Domenech's two-volume work on the Deserts of North America, need be added to a library of Navajo literature.

Of reports of military expeditions against the Navajos between the years 1845 and 1863, few contain material of geographic value, and all relate to the south and east borders of the reservation. Simpson's report of 1850 is, however, a remarkable book and remains the most complete and most accurate description of any part of the Navajo reservation.[1]

The search for a transcontinental route led to the expeditions of Sitgreaves (1851-52), Whipple (1853-54), and Ives (1857-58), along the line of the present Santa Fe Railroad. Beale's expedition (1858) is interesting chiefly because camels were used for transport. Powell, in 1871, and Howell of the Wheeler Survey (1873) crossed the reservation from Lees Ferry via Moenkopi and Oraibi to Fort Defiance over part of the route previously traversed by Newberry and Ives. On the north border of the reservation Newberry and Macomb (1859), and Holmes, Jackson and Gannett of the Hayden Survey (1875) studied the upper San Juan Valley.

Early exploration of the western portion of the Navajo country resulted from the foresight of the Latter Day Saints. In search of "an opening to preach the gospel," Jacob Hamlin undertook a series of expeditions through Piute and Navajo lands to the Hopi

[1] J. H. Simpson: The report of an expedition into the Navajo country in 1849. *Repts. of the Secretary of War, 31st Congress, 1st Session, Ex. Doc. No. 64*, pp. 55–168. Washington, D. C., 1850.

villages. In these explorations not only hostile Indians but the dreaded Colorado Canyon presented serious obstacles. For the years 1858, 1859, 1860, the dangerous "Crossing of the Fathers" (Fig. 1) was utilized. In 1862 a new route was selected crossing the Colorado at the mouth of Grand Wash. The expedition of 1869 crossed the river at the present site of Lees Ferry, the route over which Hamlin conducted Major Powell two years later, and which remains the only route in general use between southern Utah and Arizona. Following a series of disastrous experiments a colony was located by the Mormons in 1878 on the oasis of Tuba, the only permanent settlement ever established between the Little Colorado and the San Juan without the aid of the Government.

Since the days of the Hayden Survey many archæological reports of a technical character, dealing chiefly with the Hopis and the easily accessible cliff ruins, have been published. Several of these papers have geographic value, and the writings of Mindeleff, of Fewkes and of Prudden in particular are essential to a library of works relating to the Navajo country.

The scarcity of water, the unfriendly attitude of the Indians, and the lack of attention given to the Navajos by the Indian Office, is responsible for the fact that in many respects the geography of the Navajo country is an unworked field. At the beginning of my explorations in 1909, Fort Defiance, Pueblo Bonito, Leupp, Tuba and Shiprock, on the borders of the Navajo Reservation, and Keams Canyon near the Hopi villages, included the Government officials. At that date only one man had succeeded in establishing a trading post north of Black Mesa.

## Topography

In its larger topographic relations the Navajo country is part of the Colorado Plateau Province,—a region of intricately dissected sedimentary strata. About 90 per cent. of its surface lies between the contour lines of 4,000 and 7,000 feet,—the zone of sage and piñon. The extremes of elevation (3,000 feet at the mouth of the Little Colorado and 10,416 feet on Navajo Mountain) permit of wide variation in amount of rainfall and character of vegetation. Broadly speaking, the Navajo and Hopi Reservations constitute a plateau in which the depth of canyons about equals the height of mountains; or, in other words, the downward departures from an uneven surface at 5,500 feet are nearly equal in amount to the upward departures. With the exception of the laccolithic uplifts of Carrizo and Navajo Mountains, the topographic features are those

resulting from erosion operating on a gigantic scale. Faults have played no part in controlling the work of streams and the monoclinal folds are of such large dimensions as to interrupt but slightly the general horizontal attitude of the strata. If the Tertiary and Mesozoic strata stripped from underlying beds were restored, a plateau with broadly warped surface, standing at an elevation of about 9,000 feet, would occupy the region along the Arizona-Utah boundary. Great thicknesses of massive sandstone strata alternating with less resistant formations favor the development of lofty flat-topped masses, and many of the highland areas attaining the proportions of mountains are essentially mesas carved from horizontal or slightly tilted strata and bordered by cliffs of commanding proportions. Mesas of the second and third order and innumerable buttes of both sedimentary and igneous materials are characteristic features. Mesa, butte, volcanic neck, canyon, wash, repeated indefinitely are the elements of the Navajo landscape. Rincons, alcoves, towers, columns, windows, arches, and miniature erosion forms of infinite variety and rare beauty stand as ornamental carvings on the larger architectural features. Topographic features of all grades show the influence exerted by aridity. The stream channels are, for the most part, without water, yet enormous accumulations of coarse alluvium, the product of floods, are to be seen on all sides. Talus slopes are in general replaced by bare walls and bed rock is in many places swept clean by winds. The interrupted sheet of wind-blown sand which covers the Navajo Reservation thickens in places to form dunes, traveling with the prevailing southwest wind.

Vegetation, which forms a more or less continuous mantle at higher elevations, is insignificant in amount below 5,000 feet, where desert conditions prevail. These low-lying areas are, however, singularly attractive. Both sand and rock are brilliantly colored; the land is a "painted desert." The gray tones of other regions are replaced by reds and browns, yellows and greens and blacks in masses miles in extent, or mingled to form the "variegated shales" of the early explorers.

*Major Topographic Features.* . The Navajo country is too large and too diversified an area to treat as a geographic unit. Only in a broad sense are the various portions of the reservation alike. It has therefore been found advisable to establish geographic subprovinces on the basis of topography, vegetation, water supply, and other factors which have influenced the manner of life of the native and immigrant population. Twenty-two provinces thus outlined are

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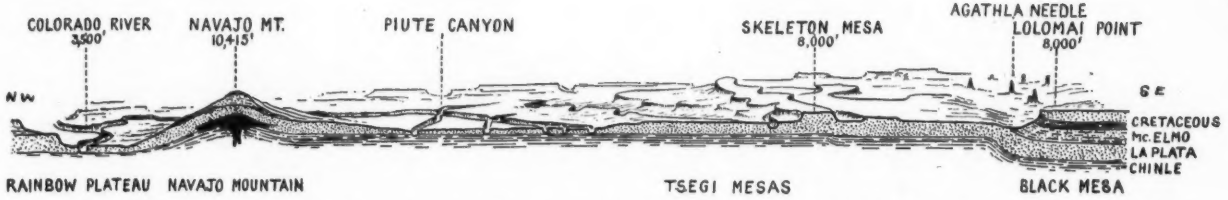


FIG. 2—Diagrammatic section, extending southeastward from the junction of the San Juan and Colorado Rivers to the north rim of Black Mesa. Navajo Mountain, the highest summit in the Navajo country, is a laccolith from which the cover of sedimentary rocks has not been removed. The Piute and other streams of Rainbow Plateau and Tsegi Mesas provinces are deeply intrenched in nearly vertically walled canyons. In the Skeleton Mesa region are numerous cliff ruins, many of them unexplored. Agathla and neighboring spires are volcanic necks.

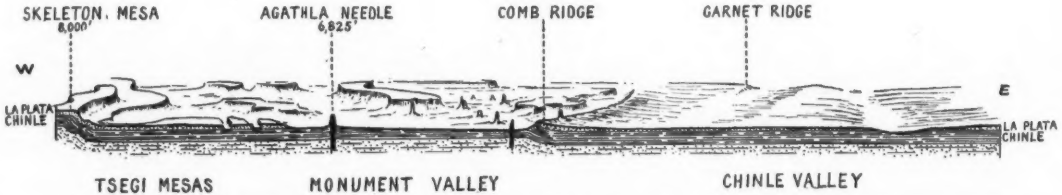


FIG. 3—Diagrammatic section on a west-east line through Agathla Needle. The descent from Skeleton Mesa is accomplished by a series of steps in a compound monoclinal fold. Monument Valley, bounded by the toothed cuesta of Comb Ridge, receives its name from erosion remnants both igneous and sedimentary. Garnet Ridge is the American source of jewel garnets (pyrope), popularly known as "Arizona rubies."

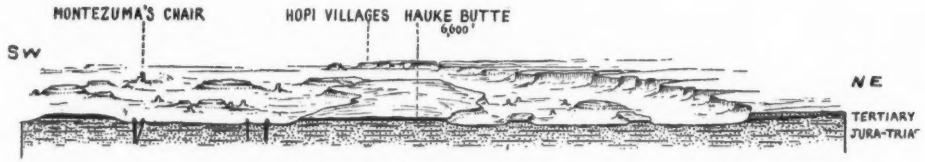


FIG. 4—Diagrammatic section, Oraibi Wash to the southeastern edge of Black Mesa. Montezuma's Chair and other buttes in the foreground, including Hauke Mesa, are volcanic necks and lava-capped buttes. In the mouths of canyons issuing from the rim of Black Mesa are cornfields and ruins. The present Hopi villages, seven in number, are perched on three capes extending southward into a sea of desert sands.

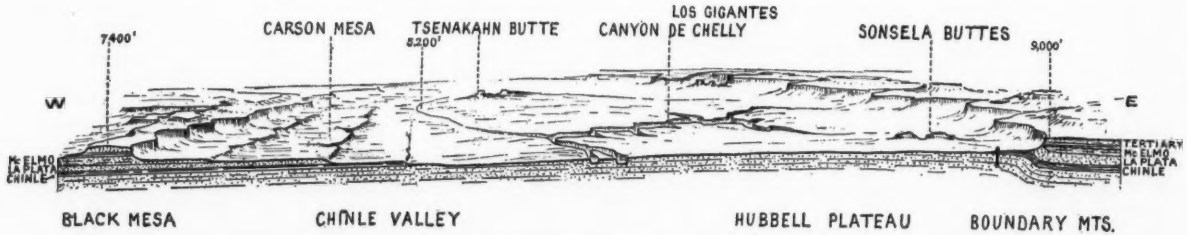


FIG. 5—Diagrammatic section across Chinle valley. The steps leading from Black Mesa eastward correspond in height with the thickness of the Jura-Trias formations. The vertically walled Canyon de Chelly, famous for its cliff ruins, traverses the crest of a low anticline which has given rise to Hubbell Plateau. Sonsela Buttes are volcanic. The Boundary Mountains, capped by Tertiary sediments and lavas, form the eastern limb of a great upwarp, of which Black Mesa is the western margin

discussed in a report to the Geological Survey. For the purpose in hand the accompanying series of diagrams have been designed to bring into relief the major topographic features of the region. (Figs. 2-5.)

*Minor Topographic Features.* Topographic features resulting from erosion by wind and water are too varied to justify detailed description. A few selected views will, however, aid in filling in the outlines presented in the general topographic sections (Figs. 8-14).

## Climate

Without presenting tables of meteorological records, the climate of the Navajo country may be summarized by the following general statements:

The Navajo Reservation is outside the path of frequent cyclonic storms; and the progressive alternations between high and low barometer, warm and cold "spells," wet and dry periods, which characterize the climate of most other portions of the United States are absent. There is a difference of about 3° of latitude between the southern and the northern edges of the area, but the influence of this factor is so completely nullified by topography that Hite (37°50′ N.) is warmer and dryer than Holbrook (34°55′ N.). Topography, in fact, may be considered the primary factor in the climate of the Navajo country. Fort Defiance, elevation 6,900± feet, is colder and wetter than Holbrook, Tuba, and Aneth, 2,000 feet lower. In the Little Colorado Valley group of meteorological stations, Flagstaff (elevation 6,907 feet) has a rainfall of 23.87 inches and a mean annual temperature of 44.7°; Holbrook, elevation 5,069 feet, has 9.16 inches of rain, and a mean annual temperature of 54.2°; and Winslow, elevation 4,853 feet, follows with an annual rainfall of about 7 inches and a mean annual temperature of over 55°. A snowfall of 2 inches per year is normal for Holbrook; the corresponding figure for St. Michaels, elevation 6,900 feet, is 46.1 inches. At elevations on the reservation above 7,000 feet, snow may fall at any time between October 1 and June 1, and may remain on the ground for days or even weeks. My Indian guide says that snow, in some years, lies on Navajo Mountain (10,416 feet) well into July, and San Francisco Peak (12,611 feet) retains its snow in protected places throughout the year. Temperatures associated with elevation determine the length of the growing season and outline, therefore, the areas of land adapted to various crops. The higher lands are too cold for corn and, beginning with 7,000

feet, agriculture must be adjusted to a growing season varying from 89 days at St. Michaels (elevation 6,900 feet) to 143 days at Tuba, and 201 days at Hite on the floor of the Colorado Canyon in Utah. The general effect of elevation is greatly modified by secondary topographic features. The climate of the floor of a canyon may be quite unlike that of the canyon rim. Peaches thrive on the floor of Canyon de Chelly, while the climate of the plateau above is unfavorable for corn, and the cliff dwellers long ago learned that one canyon wall offers favorable locations for homes not afforded by the opposite side.

The rainfall of the Navajo country is characterized by extreme variability in annual, seasonal, monthly and daily means. As shown in the chart (Fig. 6) for Fort Defiance-Fort Wingate-St. Michaels,

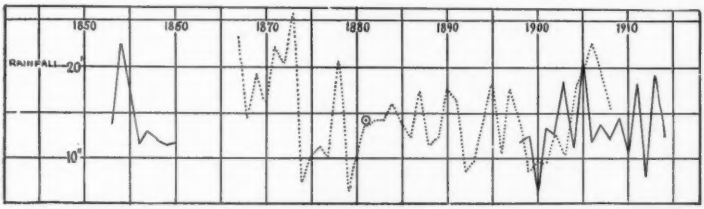


FIG. 6—Mean annual rainfall, Navajo Reservation. Table constructed by combining records by Army officers with those of volunteer observers reporting to the Weather Bureau. Figures for 1853-1860, 1881, and for 1898 to 1904 inclusive, are for Fort Defiance. In 1905 the Fort Defiance rain-gauge was removed to St. Michaels. The records for 1867-1908, indicated by dotted lines in the diagram, were taken at Fort Wingate. St. Michaels is eight miles south and Fort Wingate thirty-seven miles southeast of Fort Defiance. The elevation of these three stations, approximately 6,850, 6,900 and 6,990 feet respectively, and their topographic position are closely similar.

three stations whose location, elevation and topographic position are so closely similar as to justify treatment as a single station, the annual variation is abrupt and of wide amplitude. The monthly records (Fig. 7) reveal the presence of a rainy season in July and August. Following a period of extreme dryness during which no rain at all may fall, the summer rains become the factor of commanding importance in the Navajo climate. Their presence insures a crop of corn; their absence involves a serious depletion of the native food supply. The meteorological records show that less than 1 inch of rain falls during July, 6 years out of 18 at Fort Defiance; 4 out of 10 at Keams Canyon, near the Hopi villages; 11 out of 13 at Tuba; and 5 out of 22 at Holbrook in the Little Colorado Valley. Clear skies prevail in this region. Flagstaff, 40 miles west of the reservation line, receives 81 per cent. of the possible amount of sunshine; and it has been estimated by the U. S. Weather Bureau

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that northern Arizona as a whole has, on an average, 210 clear, 85 partly cloudy, and 70 cloudy days in the year. During May, June, October and November the skies may be cloudless for 5 to 15 days in succession. On the other hand, rain clouds may gather any day during late summer. During August, 1911, showers between 11 and 1 o'clock with a precipitation of from 0.01 to 0.20 inches, were experienced 22 days in succession.

The characteristic storm of the Navajo Reservation is the thunder shower of extreme violence and lasting usually less than an hour. Gentle rains lasting for more than 24 hours are of very rare occurrence. Only one such was experienced during my four seasons' work. The area covered by the shower is frequently only a few square miles, and on two occasions showers of 20-30 minutes duration resulted in wetting less than 300 acres. Many of the storms

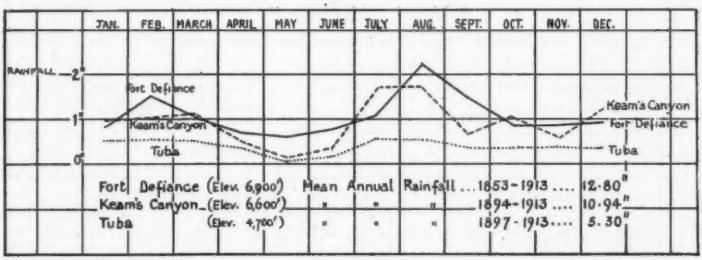


FIG. 7—Diagrams of mean monthly rainfall at Fort Defiance, Keams Canyon, and Tuba.

result in a heavy downpour and the total precipitation for a month is not infrequently the result of a single shower. During hot summer days masses of storm clouds gather, and rain descends without, however, reaching the ground; and on one occasion the only result of a violent thunderstorm which filled the upper air with water was a handful of hailstones dropped into camp. Generally, the intense heat preceding a shower is reëstablished within an hour or two after the rain has ceased, especially at elevations below 6,000 feet. So quickly is clothing dried after one of these showers that it was found unnecessary to carry tents even during the rainy season.

Lightning is the almost invariable accompaniment of summer showers and constitutes a real danger to travel. During 1911, six Indians were killed by lightning and on two occasions my camp equipage was hit by a bolt. Lightning ranks first as a cause of forest fires in this region,[2] and partly burned trees are everyday sights in the highland forests.

[2] F. G. Plummer: Lightning in Relation to Forest Fires, *U. S. Forest Service Bull. 3*, 1912. 39 pp.

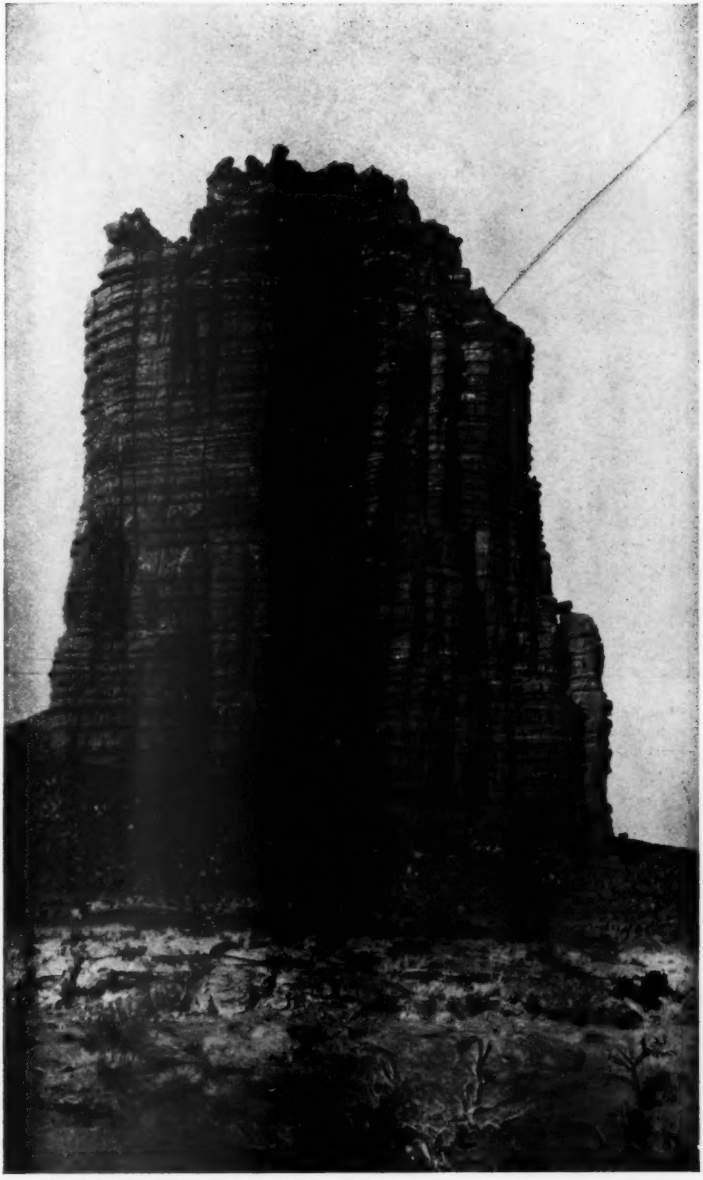

FIG. 8—Organ Rock, Moonlight Valley, Utah; an erosion remnant 400 feet in height worn from brilliantly banded shales of Permian age.

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FIG. 9—Butte of massive sandstone resting on a pedestal of shale; one of a group of "monuments" in Monument Valley, Utah. The column of massive red sandstone is about 200 feet high and rests on a pedestal 300 feet high.

FIG. 10—Upper part of a canyon wall on the edge of Moenkopi Plateau.

All stations on the reservation record temperatures below zero and all except Fort Defiance normally experience several days each year with temperatures exceeding 100°. The daily range of temperature is over 40° and usually exceeds the difference between the means of the warmest and coldest months in the year, and consequently cool or even uncomfortably cold nights follow the heated days. In the sun the heat of summer is intense; in the shade of a rock or tree coolness prevails and unlike humid regions, the line between scorching heat and delightful temperatures is sharply drawn at the edge of a shadow.

Extensive areas of dunes and rippled flats of eolian sands widely spread over the Navajo Reservation bear witness to the activity of the wind. Rocks polished and etched by wind-blown sand, vegetation buried waist deep, and fields of corn with leaves cut into shreds are common. Sandstorms are of frequent occurrence and whirling columns of dust reaching high into the air may be counted by the dozens on clear summer days. During the larger storms the sky is darkened and the swiftly driven sand grains impel man and beast to seek shelter in some friendly arroyo. These storms are at their worst in the Little Colorado Valley, and on the Kaibito Plateau. The oasis of Tuba is walled in on the west by sand, piled against a windbreak made of trees, and the school grounds at Leupp are alternately buried and excavated. Fine sand, driven by strong winds, finds its way into the best constructed buildings. In the picturesque Navajo mythology, the Wind People were sent to dry up the earth, and "Wind with Night" (sand storm) is the most dreaded expression of these powers for evil.

In general the keynote of the climate of the Navajo country is variability; local climates prevail; canyon adjoining plateau, two adjoining valleys, the opposite sides of mountains and mesas, and even opposing canyon walls may have different climates. The summers are very hot; the winters are very cold; daylight is accompanied by heat, darkness by chilliness. Flood and drought appear at irregular intervals and with variable intensity. The kindly spirit who sends the gentle shower and the evil beings who remove the moisture from the air are continuously in the mind of both Navajo and Hopi.

## Flora

The early explorers were disagreeably impressed by the flora of the Navajo country. As stated by Simpson, the "rocks are almost universally bare of vegetation except that of a sparse, dwarfish,

sickening-colored aspect''; and ''cannot be regarded . . . . . .without a sensation of loathing.'' A more intimate acquaintance with the reservation brings to view a widely distributed and widely varied flora of peculiar ecologic interest which awaits the attention of botanists.

Approximately 5 per cent. of the Navajo-Hopi Reservation may properly be called ''forested'' in the sense of extensive areas of trees, chiefly yellow pine, exceeding 40 or 50 feet in height. An additional area, perhaps 20 per cent., is covered with piñon and juniper 10-20 feet in height, and numbering 100 to 200 individuals per acre; and probably one-half of the remaining 75 per cent. of the total area is marked by scattered piñon and cedar with 1-20 trees per acre. Sage, greasewood, and grass, widely variable in amount and luxuriance of growth, are found among the trees and between the bare stretches of rock and soil outside the forested area. Except in a few localities, all types of plants grow as individuals or small isolated groups; continuous sod is unknown. The total space occupied by plants is probably less than 10 per cent. of the area of the reservation, and it is possible, by taking care, to walk from Carrizo Mountain to Lees Ferry without stepping on a twig or a spear of grass.

Within the limits of the Navajo-Hopi Reservation the factor of latitude has little effect on plant life. Topography and altitude with their attendant climatic controls determine the character of the plant life and the boundaries of ecological provinces. For the region as a whole, four zones of vegetation are readily distinguished:

1. Zone of cottonwood, cactus, and yucca, altitude 3,500-5,000 feet; type area, Little Colorado Valley. Within this zone, vegetation is scanty and over large areas very inconspicuous. ''Flat-leaved'' and ''globular'' cacti are abundant, yucca is common; grass is absent or scanty and commonly in detached tufts; sage and greasewood are of small size; scrub cedar and piñon are rare. During the rainy season there is a profusion of annuals, among which Mariposa lily, yellow sun-flowers and related *compositæ* are abundantly represented. In places fields several acres in extent of yellow flowers were noted. Wild flax is fairly common.[3]

2. Zone of sage brush (*Artemisia*) and greasewood (*Sarcobatus*); altitude 5,000-6,000 feet; type locality, upper Pueblo Colorado Wash. Sage within this zone attains heights of four to five feet and, in places so closely spaced as to render travel difficult, may occupy the surface to the exclusion of trees. Besides the ever-present sage and greasewood, grass is fairly abundant in this zone. Patches of piñon and cedar are irregularly distributed, usually along rocky ridges, but are in general of ''scrub'' size (Fig. 15).

[3] An early Spanish name for the Little Colorado River is Rio de Lino. Ives (1861) uses the term Flax River. The Navajo name is Tolchico, "red water canyon."

FIG. 11—Entrance to Todilto Park. The wall of massive, cross-bedded, red sandstone on the left is 220 feet high.

FIG. 12—Wind erosion, Kaibito Plateau. The rock is cross-bedded sandstone; wind polished and faceted pebbles are seen in the foreground.

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FIG. 13—The Rainbow Natural Bridge, north base of Navajo Mountain: cut from red sandstone. The bridge arch is 274 feet wide at the base and rises 308 feet above the stream in Bridge Canyon: probably first seen by white men in 1909.

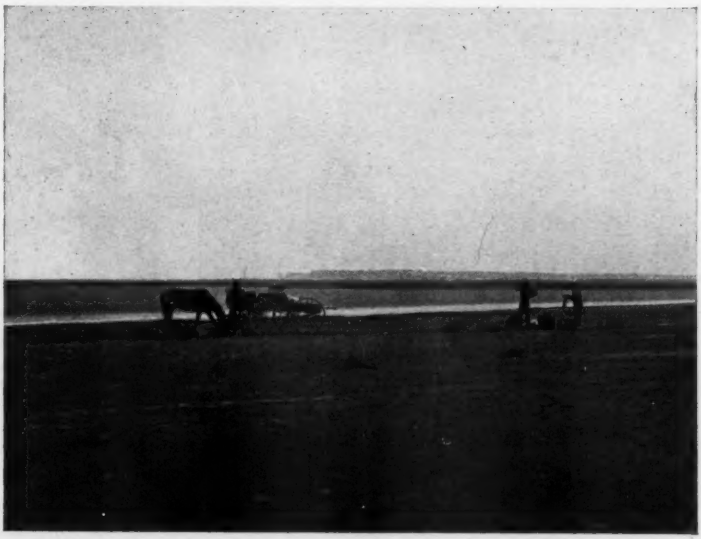

FIG. 14—Tolani (Navajo, "Many Waters") Lakes, at lower end of Oraibi Wash; one of two permanent bodies of fresh water on the Navajo Reservation below 7,000 feet.

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FIG. 15—Field of sagebrush with groves and individuals of piñon and cedar. Border of Pueblo Colorado Wash, elevation 5,600 feet. The sagebrush averages about four feet in height.

FIG. 16—Piñon and cedar in a valley among the Hopi Buttes. Elevation 6,200 feet.

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FIG. 17—Forest of yellow pine on Hubbell Plateau between St. Michaels and Ganado. Elevation 7,400 feet.

3. Zone of piñon (*Pinus edulis*) and cedar (*Juniperus monosperma*); altitude 6,000-7,000 feet, the cedar in general occurring at lower altitudes than the piñon; type locality, south edge of Black Mesa. Much of the piñon and cedar is of scrub character, but trees 12-20 inches in diameter are not uncommon and would yield 1-25 cords of firewood per acre (Fig. 16). Sage brush, and to a less extent greasewood, usually of strong growth, occupy open spaces. Groves of piñon surrounding parks of sage is the ordinary arrangement. Scrub oak and box elder are also found. Pine and a second variety of juniper (*Juniperus scopularum*) and aspen (*Populus tremuloides*) are found in a few well-watered canyons. Grass in tufts and scattered mats grows everywhere except in the densest shade.

4. Zone of yellow pine, altitude 7,000-8,500 feet; type locality, Hubbell Plateau (Fig. 17). The pines form solid forests over many square miles. The trees stand far apart and, as was long ago noted by Loew,[4] there is a singular absence of trees of intermediate heights. Engelmann spruce and Douglas spruce in groves of a few individuals are found here and there clinging to canyon walls, especially on north slopes; and white oak (*Quercus alba*) in close-set patches attains considerable prominence. Quaking aspen commonly occurs in the upper mountain valleys. Pine grass is common.

Yellow pine is practically absent from the higher parts of Black Mesa and the Tsegi Mesas at altitudes where it is to be expected. Lack of water rather than unfavorable temperature is believed[5] to account for the absence of pine at elevations between 7,000 and 7,700 feet on Black Mesa. In support of this view the presence of fir and aspen at this elevation is cited as conclusive evidence. An additional bit of evidence is the fact that, in the canyons of Tsegi Mesas and in sharp indentations on the side of Black Mesa, pines are growing vigorously.

5. Zone of Engelmann spruce; altitude 8,500-10,416 feet (the highest summits); type locality, Navajo Mountain. Outside of the type locality small groves of spruce were noted on Carrizo and the Boundary Mountains, and on Dutton Plateau. On the crest of Navajo Mountain spruce trees 12-30 inches in diameter and 70-80 feet high occur. In open spaces beneath the trees, black jack, oak, willow, ground juniper, manzanita, sage, gooseberry and raspberry attain luxuriant growths, while flowers in large variety are embedded in the grass. The profusion of flowers at moderate altitudes is remarkable for variety of species and abundance of individuals. Simpson[6] collected 90 varieties during a day's travel, and twenty-two species of plants were found in blossom on Navajo Mountain.

The boundaries of the zones roughly outlined above are subject to considerable shifting in harmony with topographic position. In general, the zone boundaries descend on the north and east, but plant societies characteristic of one zone may be found within another zone, appearing strangely out of place. Piñon represented by

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[4] Geog. and Geol. Surveys West of 100th Meridian, Vol. III, 1875, pp. 603-604.

[5] Personal communication from Mr. Don. B. Johnson of the Forest Service.

[6] P. 96 of the report of Lieut. J. H. Simpson of an expedition into the Navajo country in 1849. *Repts. of the Secretary of War, 31st Congress, 1st Session, Ex. Doc. No. 64*, pp. 55-168. Washington, D. C., 1850.

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individuals was found in the Colorado Canyon at 3,500 feet and at 9,000 feet on Carrizo; cacti are found at all elevations and the cottonwood, abundant along the San Juan and the Little Colorado, reappears up to 6,000 feet.

Of cultivated plants corn and cotton, probably also melons and beans, date from pre-Columbian days. The peaches at Tusayan and on the canyon floors at Nazlini, Chinle, and elsewhere were introduced by the Spaniards. Wheat was grown by the Navajos at Tsehili prior to 1849 and alfalfa at an even earlier date.

### Fauna

Previous to the Spanish invasion the inhabitants of Navajo land appear to have had no domesticated animals except the coyote-like dog. Animal food was supplied by rabbits, prairie dogs, wild turkeys, mountain sheep, and particularly antelope and black-tailed deer, which were abundant in this region until about 1875 and are still seen occasionally. The introduction of sheep and goats has greatly modified the diet of Navajo and Hopi alike, and the addition of horses, obtained first by raids on the Mexican settlements, has facilitated the evolution of the Navajo from a nomad hunter into a wandering stockman operating on an unrestricted range.

### Water Supply

The Navajo Reservation is superabundantly supplied with drainage channels, but the Colorado is the only stream which maintains strong flow throughout the year. The San Juan is perennial, but its daily discharge during the summer is very small. The monthly discharge of the Little Colorado at Holbrook during spring and early summer drops to 3 to 5 second-feet, and for the 100 mile stretch below Winslow the attractive blue line of the government map should be replaced by symbols indicating ephemeral flow. Several mountain streams are perennial for short distances, but thousands of stream courses hold water only for a few hours following rains.

The average of mean annual precipitation records for nine stations within and near the Navajo Reservation is 8.29 inches, or 0.69 inches per month, an amount which, even if equally distributed, would be insufficient to maintain permanent flow, even under favorable conditions. In reality, the variation in annual rainfall at all stations is over 100 per cent.; in the Painted Desert 1,000 per cent. and evaporation amounts to about 50 inches a year. The influence

of these factors taken in connection with the sparse vegetation produces great and sudden fluctuation in the volume of water carried by the streams on the Navajo-Hopi Reservation. In general, the canyons and washes are alternately flooded and nearly dry during the rainy season, and are without water during the spring and fall. In May, 1909, water to the amount of about 300 gallons per minute was flowing over Grand Falls on the Little Colorado. In June the stream was dry; by July 20 it had risen 6 feet, and attained in places the width of one-half mile. During the course of field work, July 10-21, 1913, no flowing water was found in the Little Colorado between Sunset Crossing (Winslow) and Black Knob. At noon on July 21 the water began to rise and by night had reached a stage where crossing was dangerous. During August, 1911, the Pueblo Colorado was observed to rise 13 feet in four hours; and in August, 1909, the lower Oraibi Wash, which had been dry for six months, rose during one night to a height which necessitated swimming with the horses. Following rains, the water in Tusayan, Pueblo Colorado, Wide Ruin and Chinle Washes and in Black Creek and Chuska valleys expands in places to form sheets from 100 to over 1,000 acres in extent. Frequently the rise of water is unconnected with rainfall in the vicinity.

The fluctuations in volume of stream are greatest and most sudden in the smaller channels; that the larger streams possess the same character is shown by quantitative measures on the through-flowing streams bordering the reservation. The San Juan River in January, 1905, discharged a minimum of 40 second-feet; for June of the same year a maximum flow of 24,800 second-feet was recorded. In July, 1904, this stream reached a minimum discharge of 20 second-feet, as contrasted with 20,000 second-feet in October. During the year 1906 the Little Colorado at Holbrook, where this stream is perennial, recorded a monthly maximum discharge of 3,540 second-feet and a minimum of 3 second-feet. For November, 1905, the difference between maximum and minimum flow was 20,150 second-feet. Not only is there a great difference between maximum and minimum discharge for each month, but the flow during corresponding months of different years varies from 500 to 1,500 per cent. for the San Juan. For the Little Colorado the maxima for November, 1905, and November, 1906, were respectively 20,180 and 63 second-feet, over 300 times as much in successive years.[7]

Those who are acquainted with this region retain vivid impres-

[7] Records of stream flow obtained from various publications of the United States Geological Survey.

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sions of the rapid and unpredictable fluctuations of stream volume, —impressions based on experiences which involve both hardships and danger. In deep, narrow canyons the rise of water supplied by some insignificant tributary is sufficient to render the canyon impassable, a change which may come without warning and involve skillful and rapid movements to transfer one's outfit to some shelf of rock beyond the reach of the temporary flood. One season's work is sufficient to teach respect for the most innocent-looking dry channel, and to learn the wisdom of faithfully following the Navajo rule: "Always camp on the other side of the wash."

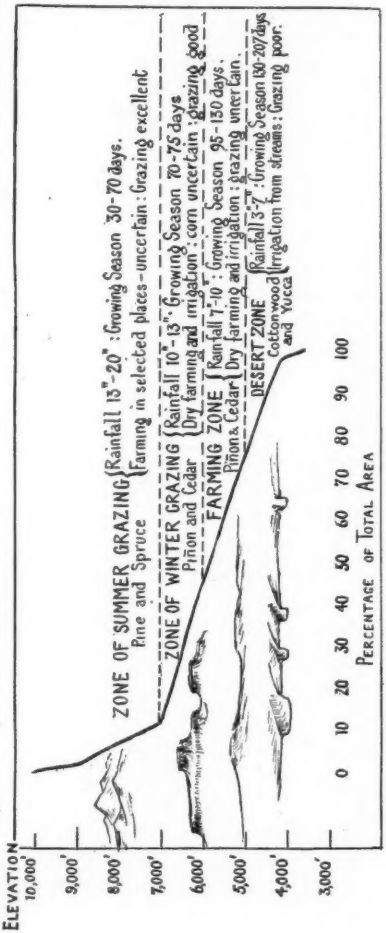
ZONE OF SUMMER GRAZING
Rainfall 13"-20" : Growing Season 30-70 days.
Pine and Spruce
Farming in selected places - uncertain : Grazing excellent
ZONE OF WINTER GRAZING
Rainfall 10"-13" : Growing Season 70-75 days.
Piñon and Cedar
Dry farming and irrigation : corn uncertain : grazing good
FARMING ZONE
Rainfall 7"-10" : Growing Season 95-130 days.
Piñon & Cedar
Dry farming and irrigation : grazing uncertain.
DESERT ZONE
Rainfall 3"-7" : Growing Season 180-207 days
Cottonwood and Yucca
Irrigation from streams : Grazing poor.
ELEVATION
10,000'
9,000'
8,000'
7,000'
6,000'
5,000'
4,000'
3,000'
0 10 20 30 40 50 60 70 80 90 100
PERCENTAGE OF TOTAL AREA

FIG. 18—Diagram summarizing the factors of elevation, topography, rainfall and vegetation as related to grazing and agriculture in the Navajo country.

The relation of variable rainfall and fluctuating stream flow to the habitability of the Navajo country is obvious. Agriculture, without irrigation except for specialized crops, is impossible. The discharge of perennial streams is sufficient for watering large tracts by stream diversion, and reservoirs are short-lived owing to the abundance of silt. As agricultural land, therefore, the reservation has small value. The needs of the stockman present an entirely different water problem: not to ensure more water where water is already sufficient, but to develop numerous small but reliable supplies where water is not now attainable. Springs must be developed and protected and wells dug until all the grazing land is brought within reach of permanent watering

places. For this reason the attention of Government officials has been directed to a study of the occurrence and recovery of ground water.

### Summary of Physical Environment

The physical factors controlling the life and occupations of the inhabitants of the Navajo country are summarized in the accompanying diagram (Fig. 18), which also indicates the conditions under which Navajos and Hopis have attained their present stage of advancement and suggests the lines along which the development of the country is most likely to be successful.

(*To be concluded*)

Fig. 18—Diagram summarizing the factors of elevation, topography, rainfall and vegetation as related to grazing and agriculture in the Navajo country.

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## HAWAII'S GREAT VOLCANOES AND THE STUDY OF THEM

By SIDNEY POWERS
Hawaiian Volcano Observatory

The Massachusetts Institute of Technology maintains an observatory at the volcano Kilauea, on Hawaii, under the direction of Professor T. A. Jaggar, Jr. This volcano is the most continuously active and one of the most easily accessible of any in the world. Only 22 miles away is the greatest volcano in the world, Mauna Loa, rising to a height of 13,675 feet, from which, at intervals of about ten years, comes a lava flow.

Kilauea is a low, broad dome, 4,000 feet in height, the top of which, over an area of three miles in length by two miles in breadth, is a depression with a depth of about 400 feet. The depression, or sink, has been flooded by flows for many centuries from the crater Halemaumau near one end of the sink, so that Halemaumau now forms a low inner dome. The Halemaumau crater is a smaller sink, in which a molten lava lake is almost continuously active. The rim of the inner pit rises to an elevation of 3,700 feet, which is about 300 feet above the lowest portion of the outer sink. The size of the inner crater and of the lake within varies with the phases of activity, but in 1915 the crater has been about 1,200 feet in diameter, and the lake within, at a depth of 365 feet or more, from 400 to 500 feet long, and 100 to 180 feet wide.

The lava lake in Halemaumau has been active from the spring of 1907 until the present time, with the exception of an interval

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from April, 1913, until May, 1914, when the lava disappeared from sight, leaving a broad, deep funnel of slide-rock through which dense volumes of sulphurous smoke issued. The lava lake has a temperature of 1000° C. (1832° F.), and consequently a thin skin of frozen lava is maintained over the yellow-red liquid. The skin is broken by fountains which break to a height of from 10 to 40 feet; by the currents which constantly provide a streaming of the lava and of the crusts; and by splashing caves at the margins of the lake. The fountains and splashing caves are caused by accumulations of gas bursting; the streaming by convection currents within the lake.

Near the center of the lake is a fountain called "Old Faithful" because of its constancy and persistency, which breaks at intervals of alternately 10-20 seconds, and 40-50 seconds. Whenever the lava lake is active in Halemaumau, Old Faithful is usually present, and although there have been lava lakes other than Halemaumau at different times, Halemaumau has generally been active when the others have been active, and always at the same location since the earliest observations. It is therefore probable that the main feeder of the lake lies under Old Faithful, and that up this feeder gas rushes to cause the fountaining.

Besides Old Faithful several other fountains are usually active in various parts of the lake, but especially near Old Faithful. These fountains all indicate uprushes of gas. Occasionally one of the fountains is active continuously for several minutes and migrates, with a violent splashing noise, toward the side of the lake, where a "cave" develops, toward which the lava streams. A cave is generally a portion of the wall built out by spatter and where gas, in uprushing, causes a steady splash for several minutes, or sometimes several hours.

The circulation within the lake is brought about by the difference in weight of the lava when full of or free from gas, and when cooler or hotter. The solidified lava is heavier than the molten. When a fountain bursts, the gas escapes and the lava becomes heavier and sinks, creating a temporary inward suction of lava and crusts. Similarly, at a splashing cave, the gas escapes and the lava—at times the whole lake—streams toward the cave.

The lava, which has lost a large part of its gas content and is partially cooled, sinks, generating a current under the surface. New gas, rising from the magma chamber below, replenishes the supply in the lava which has descended, so that this newly "vesiculated"

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lava rises. When the gas is evenly distributed through this lava, it rises quietly, and without fountaining, under the crusts, and may flow toward the fountaining areas or toward the caves.

The rising and expanding gas, with the chemical changes which take place within the lava, and with possibly an extensive circulation in the lava below the lake, are some of the principal factors in maintaining the heat in the molten lake, which is subject to an

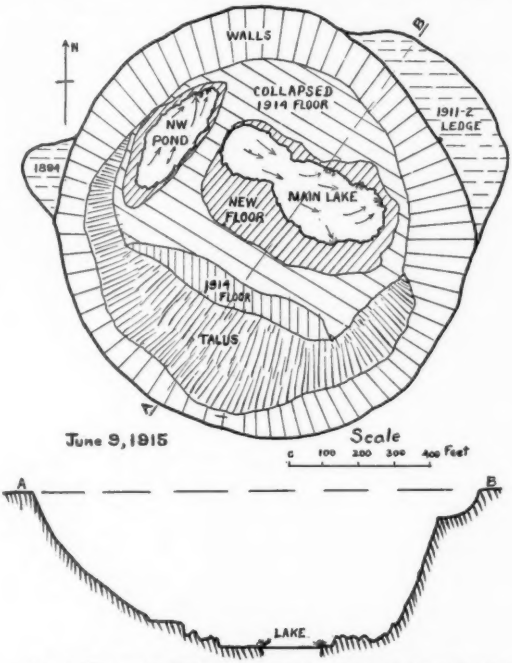


FIG. 1—The crater Halemaumau, on June 9, 1915, shown in plan-view and in section. In the pit, the main lake and the northwest pond stand at a level of about 460 feet below the rim. No fountains appeared in either the lake or pond at the time the sketch was made, but streaming (shown by arrows) and splashing at "caves" around the walls of the lake were active as usual.

enormous loss of heat by radiation and convection. When the lake rises, it gradually floods the pit and the slide-rock which has come from the walls, forming a lava floor around a circular pool. If the lake rises sufficiently high, it may completely fill the Halemaumau pit, as in January, 1912, or even spill over the edge, as in 1894.

When the lake falls, it leaves black ledges and walls around the

margins, which fall into the lake as the walls are undermined at the lake-level. The degree of tumbling in of the walls immediately around the lake, and even of the main Halemaumau walls, depends upon the amount and rapidity of the subsidence.

The vertical movement of the lava within the pit appears to be controlled to a large extent by the pull of the sun and moon as well as by the physical and chemical forces within the lava and the magma chamber below. It has been observed that at the time of the solstice the lava tends to rise, and at the time of the equinox to fall. Thus, the maximum height of the lava since 1894 was at the time of the winter solstice, January, 1912. In October, 1914, the lake reappeared after a period of quiescence, and rose until the winter solstice, reaching a maximum height of 363 feet on January 4, 1915. With the following equinox, the level dropped to 515 feet on April 3, and thereafter lagged under the solsticial pull, until the first week in June, when a definite rise began, with a level of about 460 feet on June 10. This rising phase should continue until July.

Furthermore, a daily variation of level has been noted, with a high tide at noon and at midnight—tide possibly effected by maximum barometric pressure at those times. This daily movement is relatively small, and not always detectable, but it is at times as much as 40 feet.

The volcano Kilauea is one of the attractions for tourists on the Hawaiian Islands, as the lava lake is clearly visible by day and by night unless the lava is far below the rim, when it may be obscured by sulphurous gases rising from the walls and floor. The crater is accessible by automobile road from Hilo, the largest town on the island of Hawaii, and but 31 miles away. It is seven miles by road from the Volcano Observatory and the Volcano House (Hotel) to the crater, but only three miles by path over the lava of the Kilauea sink.

Mauna Loa is the greatest active volcano in the world for two reasons: its height, 13,675 feet; and its periodic activity, at intervals of about ten years ever since the arrival of the first missionaries on the island. It is a greater volcano than Kilauea nearby, because lava flows, miles in length, pour out of fissures on the sides of the immense broad dome, and frequently run into the sea, 20 to 40 miles away. The last of these flows was in 1907, when a stream of molten rock ran over portions of several older flows, across an uninhabited strip of land, and nearly into the sea. On November

*Photo by R. W. Perkins*

FIG. 2—The lava lake in Halemaumau as seen in September, 1909, when about 90 feet below the rim of the crater. The lava is streaming toward the left and is overflowing the edge of the lake, onto the floor, producing the flow shown with lines which resemble ripple-marks. The lines are the places where the red lava shows through the thin black crusts of partly cooled lava which cover the surface of the lake.

*Photo copyrighted by Chock Chong, Hilo, Hawaii*

FIG. 3.—The lava lake in January, 1912, showing the walls of the pit, above which, in the background, is a portion of the Mauna Loa slope. The lake is about 90 feet below the rim and completely fills the crater. Many fountains are active.

*Photo by Chock Chong, Hilo*

FIG. 4—The lava lake in February, 1913. The lake has subsided slightly leaving a low wall between the molten lava and the floor of the pit. In the center of the lake a fountain is bursting.

*Photo by Chock Chong, Hilo*

FIG. 5—The small lake of February, 1915, after subsidence had begun from the level of 363 feet below the rim on January 4. Two fountains are shown bursting in the center of the lake, and a third fountain has migrated to the wall (in the upper part of the picture), to become a splashing "cave." The light-colored area on the right is a "cave."

25, 1914, came the next outbreak, this time with only summit activity. A large lava lake developed, with fountains playing both continuously and intermittently to heights of 200 to 400 feet. The volcano was ascended by only a few parties during the 48 days of known activity, because of the difficulty of the trip—a climb of 10,000 feet over the roughest kind of lava, with no water above the half-way camp, except for the snow which covered the summit after November 28; and because of the intense cold and discomfort at the top, with no shelter of any kind from the wind and weather, and no place to sleep except on the bare lava, which is just like a pile of clinkers. Before any scientific work can be done at the summit, it will be necessary to secure funds to build a shelter, both for men and for animals, and to fit the shelter with bunks. As there is no wood within miles of the summit, all fuel must be brought along. Furthermore, the mountain slopes are inhabited by wild cattle—supposed to have been there since the first cattle were landed by Vancouver in 1793; these are sometimes dangerous, and may attack parties on the side of the mountain.

The Hawaiian Volcano Observatory was built in 1912 near the Volcano House on the edge of the Kilauea sink. It comprises the main observatory building, equipped with one large laboratory, and three smaller rooms, with a seismographic cellar 18 feet square; and two small buildings, occupied by the associate and the janitor. At the crater there is a small frame building which was used temporarily for a small seismograph and for other instruments. This building is affected by sulphur smoke, and has been broken into several times by vandals, with the result that it is of use principally as a shelter.

The Whitney Laboratory of Seismology at the observatory is equipped with two Bosch-Omori seismographs, one Omori sensitive seismograph, and an Omori ordinary seismograph which records only very strong earthquakes. The seismographic work is in charge of Mr. H. O. Wood. On account of the rifted nature of the rock upon which the seismographs rest, they do not record many of the distant earthquakes, but the aim of the station is to study the local shocks.

The other laboratories are supplied with drawing tables and instruments, and a dark-room for photographic work. The surveying instruments include a solar transit loaned by the College of Hawaii, an alidade and plane-table loaned by the U. S. Geological Survey, two small Japanese transits, weighing, with the tripod,

about six and one-half pounds each, and minor instruments. A rain gauge, maximum and minimum thermometer, barograph, thermograph, and wet and dry bulb hygrometer are kept in suitable places outside the building, and the records are sent to the Weather Bureau.

The immediate aims of the Observatory are to record the varying phases of the activity of Kilauea and the occasional outbursts of Mauna Loa, and the local earthquake shocks; and to compare these with secular, meteorological and astronomical change. For the purpose of the measurement of the Halemaumau pit temporary triangulation stations have been erected around the walls. The depth of the lava is measured by triangulation, but the accuracy of the method depends upon the instrument used, the clearness of the object sighted on (usually a stalactite in front of a splashing cave), and upon the amount of smoke in the pit. The triangulation stations are at present partly constructed of loose lava blocks, which are frequently broken down by visitors as objects to throw into the pit. The height of the lake may change rapidly and the caves may cease splashing at any moment, so, with smoke obscuring the pit, as is often the case, observation is difficult.

The daily routine consists of changing the seismograph records, of taking the meteorological observations, of photographing Halemaumau from the observatory and of observing the lava lake with measurements of the depth and size. This work is more than sufficient to occupy the time of one man throughout the day, and the depth and dimensions of the lake must be computed by plotting in the laboratory. With the lake at a depth of over 450 feet, it may take an entire day to secure a few measurements.

The publications of the Observatory comprise a weekly report which is published in the *Pacific Commercial Advertiser* in Honolulu and in the *Hilo Tribune,* and later in the regular reports of the Observatory published by the Hawaiian Volcano Research Association in Honolulu at a subscription price of $5 a year. An annual report is to be published by the Society of Arts of the Massachusetts Institute of Technology. The first of these reports has been issued, the later ones have been delayed by the lack of clerical assistance in preparation.

The Observatory is supported in part by the income from the Whitney Fund of the Massachusetts Institute of Technology, but principally by private subscription. The Observatory is badly in need of funds for general maintenance, for an assistant and for

new instruments, and supplies. It is now necessary for the Director to raise sufficient money to pay the salaries, with the result that the Associate must assume charge of the observations on the lava, as well as the work on the seismographs. An assistant is needed to do the routine work which now occupies so much of the time of those in charge that there is not sufficient opportunity to compile the results of the observations. A large amount of data concerning the levels of the lake and meteorological observations, which must be plotted, now await the aid of an assistant.

The value of the observatory from the standpoint of geology is immense, because this is the only volcano in the world in which there is a liquid lava lake almost all the time, and near which an observatory may be maintained in safety. From the standpoint of service to the people in the vicinity, or to those in other volcanic regions, the observatory is of use in the prediction of volcanic activity, and of the danger of loss of life and property. While there have been only three lava flows from the sides of Kilauea since white men came to the islands, Mauna Loa is periodically active, with a lava lake and immense fountains at the summit (as from November 25, 1914, until Jan. 11, 1915), and later a lava flow from the sides of the volcano. By a careful study of the imperfect records, it has been possible to predict the date of the last activity within a period of three years, and by a comparison of the records of both Mauna Loa and Kilauea, it has been possible to predict the time of activity as at or near the solstice. Within two or three years, a lava flow is predicted by the Observatory staff, to flow down the side of Mauna Loa toward the city of Hilo, the second largest town in the islands. If sufficient funds were available it would be possible to make a topographic map of that side of Mauna Loa to show in just what direction the lava is most likely to run. With careful observations for a number of years, further predictions may be possible.

At the time of the last activity on Mauna Loa, commencing November 25, 1914, a seismic prelude was indicated by the seismograph records; and at the time of the outbreak on the summit reported by cattle men 20 miles away, there was a series of small earthquake shocks, recorded only instrumentally. As this is the first activity on Mauna Loa since the installation of the seismographs, the time of future outbreaks may be foretold more accurately by the prelude of small earthquakes, most of which are only instrumentally perceived.

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# THE ST. LAWRENCE RIVER AND ITS PART IN THE MAKING OF CANADA*

By R. H. WHITBECK
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It is an obvious fact of historical geography that large rivers play an important part in the history of the lands through which they flow. In North America, three rivers, the Mississippi, the Hudson-Mohawk, and the St. Lawrence, have been particularly important because they opened natural highways into the very heart of the continent.

The Mississippi has probably already had its period of greatest usefulness, so far as navigation is concerned. It no longer carries any considerable part of the commerce of its basin and the greater part of the products of its territory reach markets by routes that run transverse to the direction of its flow. Now that it is settled that railways and their rates are subject to governmental regulation, it does not seem that we longer need a "potential competition" from rivers that cost more to improve and maintain than their benefits to transportation are worth. At least such is the feeling that our past experience appears to justify.

But with the St. Lawrence and its chain of lakes the case is different, and it is altogether likely that this great waterway has its period of maximum usefulness yet before it, for it is the eastern gateway and practically the only gateway of a vast and productive region just beginning to rise to its possibilities.

In the settlement and development of North America, Canada has had handicaps that necessarily retarded its growth. In the United States there was a greater amount of desirable land, a more genial climate and the real or fancied attraction of a republican form of government. Our great resources and abounding prosperity, acting and reacting, have given us a century of phenomenal development, which for a time adversely affected the development of Canada. The United States will probably continue to grow more rapidly than Canada, but the contrast will be less pronounced, for Canada is feeling the tonic of a new life.

From the days of Cartier to the American Revolution, the geog-

* Read at the eleventh annual meeting of the Association of American Geographers, Chicago, Dec. 29, 1914.

raphy of the northern half of North America made the St. Lawrence a dominating factor in the history of the vast area tributary to it, and also in the history of the whole upper Mississippi Valley. The best part of Canada is the interior. The mother country lies across the Atlantic, and between that interior and the sea that leads to European markets only one practicable outlet in Canadian territory exists. Herein does the geography of Canada differ from that of the United States, and herein lies the reason why no single waterway of the United States means so much to this nation as does the St. Lawrence to Canada.

For the purpose of this paper it is convenient to present the following discussion under three main heads:

1. The physical aspects of the St. Lawrence.
2. The historical aspects.
3. The commercial aspects, present and future.

*Physical Aspects.* The course which the St. Lawrence follows to the sea was structurally determined in early geologic time. The position of the Great Lakes and of their outlet is largely due to the shape of the southern side of the old Laurentian plateau; here the younger sedimentary rocks overlap the older crystallines, and the junction forms a line of weakness along which streams and glaciers have found it relatively easy to erode. The eastern arm of the Laurentian plateau stretches off to the northeast and ends in Labrador. The Appalachian highland, which forms the eastern axis of North America, bends a little to the east as it approaches Labrador and dies out in the low Notre Dame and Shickshock Mountains south of the Gulf of St. Lawrence, thus leaving between the Laurentian plateau and the northern end of the Appalachians a broad, shallow trough. This trough is evidently of great age, for it is now occupied by Cambro-Silurian sediments tilted up on edge and peneplained. The Champlain depression submerged the valley at least 600 feet more than it is submerged at present; in the estuary which extended up the St. Lawrence trough beyond the present site of Montreal beds of rich silt were deposited, and these now make a strip of fertile land on both sides of the river. Notwithstanding the subsequent uplift of 600 feet or more, the valley is still deeply drowned at its seaward end. The real mouth of the river has been traced by soundings out to the edge of the continental plateau south of Newfoundland, 1,000 miles beyond the present head of ocean navigation at Montreal. At its eastern end this drowned valley is reported to be 3,600 feet below sea level,

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which fact gives an indication of the extent of the drowning. The river is considered to end and the gulf to begin at Pointe des Monts, but the tide rises as far as Lake St. Peter, 760 miles further. Between Montreal and Quebec the river cuts through a belt of hard slates and is considerably narrowed. It is this narrowing, coupled with the commanding heights on the north side, which made Quebec the strategic point for commanding the river and led to the erection there of the strongest fortifications in the New World.

At Montreal three geographical features combine to determine the location of the city. (1) Here is located a large island. (2) Here the Ottawa River, chief tributary of the St. Lawrence, joins it, giving the early trade advantages which arise from the junction of rivers. (3) Ascending the river, the first series of rapids is met here, making this the head of deep-water navigation, except as the rapids have been overcome by canals. From the Lachine Canal, down-river steamers are locked directly into the harbor of Montreal.

Quebec is 250 miles from the present mouth of the river; Montreal is 160 miles farther up, and Kingston (the Frontenac of old), at the outlet of Lake Ontario, is 170 miles above Montreal. Between Kingston and Montreal are three series of rapids, around which canals have been built.

CANALIZED STRETCHES OF THE ST. LAWRENCE

| LOCATION | LENGTH IN MILES | NUMBER OF LOCKS | FALL IN FEET |
|---|---|---|---|
| Head of Galops Rapids to Iroquois | 7⅓ | 3 | 15½ |
| Ogden Island to Morrisburg | 3⅔ | 2 | 11½ |
| Croil Island to Farran Pt. | 1 | 1 | 3½ |
| Dickinson Landing to Cornwall | 11 | 6 | 48 |
| Coleau Landing to Cascades Pt. | 14 | 4 | 32½ |
| Lachine to Montreal | 8½ | 5 | 45 |

Above Quebec the river narrows at various points and is already spanned by five bridges.[1] Passenger steamers drawing nine feet or less shoot the rapids on the down trip but return by the canals. These have been enlarged once since they were first constructed and now have a minimum depth of 14 feet, the same as that of the improved Welland Canal. This depth is already inadequate and must be increased by at least 50 per cent. to make them effective, even at present. The enlarging of the Welland Canal has already begun. At its eastern end Lake Ontario narrows down and be-

[1] At Cornwall, Coteau Landing, Caughnawaga, Montreal (Victoria Jubilee Bridge) and seven miles above Quebec.

comes a river at the place where a low ridge of resistant crystalline rocks extends across the channel to the Adirondacks. This range of partially submerged hills, rounded and smoothed by glacial erosion, forms the beautiful Thousand Islands.

To a traveler on the river, the St. Lawrence does not seem to flow in a trough, but rather over a plain; going down the river, there are on either shore low, level-topped banks, until Quebec is passed. On either side of the river, as far as the eye can see from the steamer, stretches an almost featureless plain cleared of its forests, and dotted with hundreds of little white farm-houses, particularly in the Province of Quebec, where the French predominate. This is most noticeable on the south side of the river in the triangular area adjacent to the northern boundary of New York State. Some 20 miles below Quebec, on the north side, low mountains reach down to the river, but on the south side not until a point about 100 miles below is reached. The filling of the ancient trough with Paleozoic sediments and the drowning of its lower portion have largely obliterated the appearance of a valley.

*Historical Aspects.* In all of the 240 years from the time of its discovery to the revolt of the American colonies, no other river in the New World so constantly and so vitally influenced historical events as did the St. Lawrence. The exceptional width of the river led the first explorers to hope that the waterway might be the much-sought-for passage to China, and at each lake-like expansion of the river above each series of rapids that hope kindled anew. Early explorers underestimated the width of North America, and they were easily deceived into believing that Lakes Huron, Michigan, and Superior might lead them on to the western sea. Nicolet evidently expected to meet Chinese at Green Bay in 1634, and went on shore dressed in an elaborately decorated mandarin robe. The St. Lawrence River was an open and inviting gateway which quickly led the French into the very heart of North America, led to the early discovery and nominal occupation of the vast region, extending from the mouth of the St. Lawrence to the mouth of the Mississippi, and to the spreading out of French settlements and a consequent scattering of French influence which must have prevented success in agricultural colonies had they been attempted. Furthermore, it made a frontier impossible to defend. It is doubtful if a better example of the beneficent and baneful influence of a great river upon history exists, certainly none in America.

So readily was the interior reached by this route that the French

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were planting their missions and posts in the Mississippi Valley while the English were still feeling their way along the Atlantic coast and a few miles up its rivers. Quebec, 800 miles inland from the edge of the continent, was founded (1608) before Boston or New Amsterdam, or any other of our eastern coast cities. Cartier reached Montreal (1535) two hundred years before Oglethorpe planted his colonies on the coast of Georgia. Green Bay, Wisconsin, antedates Philadelphia; Marquette built a hut on the site of Chicago seventy years before the English pushed through the Appalachians and established communities in Kentucky and Tennessee.

In 1687 Governor Dongan of New York wrote to England: "If the French have all they pretend to have discovered hereabouts, the King of England will not have a hundred miles from the sea anywhere." Here was a paradoxical situation, namely, the endangering of the English colonies which lay along the coast by a hostile nation which had worked its way into the interior behind them and was now pushing its frontier seaward.

The strategic importance of the St. Lawrence is emphasized by the fact that the holding of a single point, Quebec, on that river has continuously carried with it the control of an area almost continental in its dimensions. There has never been any exception to the fact that the nation which held Quebec held Canada. It has the distinction of having been besieged five times in five wars.

From the time of Cartier's voyage in 1535 down to the present, the principal events in the history of Canada have taken place along the St. Lawrence. Parkman wrote of the earlier days that one could have seen nearly every house in Canada by paddling a canoe up the St. Lawrence and Richelieu.[2] The original land grants faced the river and ran indefinitely back; no one wanted land that did not face on a river; the French land grants along the Fox River in Wisconsin have widths of city lots and depths often measured in miles. The importance even now attached to frontage on the river is shown in the shape of the counties in Quebec, seven of which have a ten to twenty-mile frontage on the river and run back 300 miles and more into the interior.

The St. Lawrence and its chain of lakes formed the actual if not the legal boundary between the French and English colonies, and during the Revolutionary War it influenced, where it did not fix, the frontier between the loyal and the revolting English colonies, and subsequently it largely determined the position of the inter-

[2] Parkman, "The Old Régime in Canada."

national boundary. It was the northward trend of the St. Lawrence, unfortunate in its effect upon Canada, which allowed the long northward projection of the present state of Maine; and the jutting of this state far into Canadian territory has caused such an effective separation of the Maritime Provinces from the rest of the Dominion that it has at times threatened to turn them to the United States. To hold these provinces securely in the Federation, the long and expensive Intercolonial Railway was built by the Dominion Government. Financially the road has been almost a failure, but politically it accomplished its purpose.

The separation of the Maritime Provinces from the rest of the Dominion is one of the reasons for their slow development. If New England's geographical position on the Atlantic seaboard is rightly regarded as having favored her development, why has that of its neighbors, Nova Scotia and New Brunswick, been unfavorable? The fact is that the direction of flow of the St. Lawrence, causing its mouth to be several hundred miles farther north than its beginning in Lake Ontario, was a geographical factor which enabled the United States to push its territorial claims farther north in the region of Maine than it could anywhere else. In the convention which settled the terms of peace after the Revolution, Franklin and his colleagues were successful in securing the cession of territory far north of the 45th parallel in Maine, but England was equally successful in securing land far south of that parallel in Ontario, for nature's boundaries have a logic which it is difficult to disregard. Geographically the St. Lawrence ought to have been the boundary, but the Maritime Provinces remained loyal to Great Britain, and, this being true, it was necessary, in fixing the international boundary, that land connection between them and the rest of Canada should be insisted upon by England. The land connection remains, but between the well-peopled parts of Ontario and Quebec on the west and Nova Scotia on the east stretch hundreds of miles of dreary country which contains but a sprinkling of population and originates little traffic for the railroads which must traverse it.

Between the cities of Quebec and Halifax, there is not a city of any size, and all of the territory covered by this 675 miles of railroad does not contain as many people as live in the Boston Basin. But even with the railroads, the Maritime Provinces are severely handicapped by the long haul necessary for the exchange of products with the well-peopled parts of the Dominion. The political

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separation of Nova Scotia and New Brunswick from New England, their natural and nearest neighbor, has developed an artificial situation wholly discordant with the geography, commercially hurtful to the provinces, and in a lesser degree to New England.

The influence of the river in concentrating population near it is strikingly seen in any map which shows the distribution of people in Quebec and Ontario.[3] Eastward from the city of Quebec the population is mostly in two chains of townships hugging the river on either side. In these river townships the population reaches an average density of 50 to the square mile on the south shore, and 10 on the north shore. But just the width of one township back from the river, with a few exceptions, the population averages from one to five per square mile.

*Commercial Aspects.* When a single river forms almost the only natural entrance from the sea to a fertile region like interior Canada, not only the river as a whole but each major feature of that river comes to have an influence in shaping the course of events. Let us consider what some of these features are in the case of the St. Lawrence.

1. By reason of the drowning of its valley ocean-going vessels drawing 30 feet reach Montreal almost as easily as they reach New York or Boston. Only the Amazon, the South American counterpart of the St. Lawrence, is comparable with it in this respect.

Since ocean transportation is much cheaper than rail it is usually an advantage to have cargoes to or from the interior transshipped at points as far up rivers as possible. This promotes the growth and importance of the up-river ports at the expense of actual or possible ones on the seaboard. Since the largest ships may ascend the St. Lawrence to Montreal, and since the most attractive part of Canada is the interior plain which extends westward from Montreal, the major part of the ships carrying the foreign trade of Canada hold their course on past the Maritime Provinces, to load and unload at the head of ocean navigation at Montreal.

Thus has this city, not Halifax or St. John, grown to be the gateway of the Dominion. Because of differences in the character of their respective rivers, New York is at the very mouth of the Hudson, New Orleans is 100 miles up the Mississippi, and Montreal 1,000 miles up the St. Lawrence.

Owing to the close interweaving of commercial, industrial and financial interests, the chief seaport of a country will grow into a

[3] See "Atlas of Canada," Pls. 27 and 27a.

manufacturing, mercantile and financial center. Upon such a port the great railroads will converge. Every one of Canada's great railway systems either reaches Montreal or is heading for it. Montreal is even more the one commercially strategic port of Canada than is New York of the United States. We have Boston, Philadelphia, Baltimore, New Orleans, Galveston and a dozen minor ports. In Canada the limitations imposed by topography and climate rigidly restrict the number of possible eastern outlets and accentuate the importance of the St. Lawrence. Further advantage accrues to Montreal from its position at the mouth of the Ottawa, the chief tributary of the St. Lawrence and the outlet of a great lumbering region, and also from its position near the head of the Champlain-Richelieu valley, the natural route by rail between the United States and eastern Canada.

2. The second significant feature of the river is its geographical position in the continent. *It flows east into the Atlantic, not west, not north.* It opens toward Europe. When you sail down the St. Lawrence you make nearly direct headway toward the lands which call for and originate the greatest commerce of the world. Not so with our own Mississippi, every league toward whose mouth is probably half a league farther from your destination. Since Canada must look to Great Britain as the principal terminus of its over-sea traffic, the eastward flow of its greatest river is a commercial asset whose value is best appreciated by contrasting its present usefulness with its probable usefulness if it flowed north to Hudson Bay or the Arctic or west to the Pacific.

3. The lowlands included in the peninsular part of Ontario, lying near the great lakes and extending down the river half way to its mouth, are the best agricultural lands of the Laurentian provinces. Here the Dominion reaches farthest south, has the mildest climate, can raise the most varied and valuable crops, is best served by railroads, has acquired the densest population and built up the largest cities. Here live half the people of Canada (1910) and here 900 million of the Dominion's 1200 million dollars' worth of manufacturing is done. While manufacturing has reached no high stage of development in Canada, yet there are thirteen cities that annually manufacture over ten million dollars' worth of goods. Of these thirteen cities in the whole area of Canada, nine are in that part immediately tributary to Lake Ontario and the St. Lawrence.

In this connection an interesting example of the interrelation

of political and geographic influences appears. Owing to the fact that the St. Lawrence is essentially a Canadian river and the Welland Canal a Canadian canal, American shipping down the Great Lakes nearly all terminates at Lake Erie ports and has built up several of our leading cities on the shore of that lake. For American commerce, Lake Ontario is hardly a part of the Great Lakes system at all, and there is not a single large city on the American side of this lake. On the Canadian side it is just the contrary, for all of the important cities are on Lake Ontario or the St. Lawrence and none on Lake Erie. On one side of the boundary, Lake Ontario and the St. Lawrence are of the utmost influence in fixing the location of cities, but on the other side that influence is practically nil, yet it is the same lake and the same river in one case as in the other.

4. The head of ocean navigation on the St. Lawrence fixes the focal point for all railway lines in the eastern part of Canada. At this point—Montreal—the great transportation lines converge. From the west, southwest and northwest come the Canadian Pacific, the Grand Trunk and the Grand Trunk Pacific. East of Montreal they all spread out fan-like to their Atlantic terminals.

5. It has been pointed out that the easterly flow of the St. Lawrence greatly enhances its value, *but it does not flow directly east,* and because it does not, its power to control the movement of outgoing commerce suffers a severe limitation. During seven months of every year Montreal has all of the advantages of a port on the coast. In summer the ships sail almost scornfully past the ports of the Maritime Provinces to Montreal; but when November comes the St. Lawrence is either closed by ice or is so dangerous that marine insurance rates rise to many times the rates on cargoes out of New York.[4] After November the wharves at Montreal lose their activity, for the currents of commerce have changed their courses to new outlets. Halifax, St. John, Portland, Boston, and New York now become the gateways of the Dominion. Herein the St. Lawrence fails and, failing, adds to the other handicaps already imposed by the Canadian climate.

If the St. Lawrence flowed from Lake Ontario directly eastward

[4] The all-water rate on wheat from Fort William on Lake Superior to Montreal in November, 1911, was 4½ cents a bushel. By water to Buffalo, thence by rail to New York, the rate was 9 cents a bushel, just twice as much, yet 48 per cent. of the Canadian wheat that came down the Lakes, went out by way of Buffalo and New York. Inquiry into the cause showed that New York has much the better steamship service to Liverpool, gets lower ocean rates on wheat than Montreal, and has a November insurance rate of 12½ cents to 15 cents on $100, against a rate of 65 cents to $1.10 on cargoes from Montreal.

to the Atlantic, its mouth would be in New England, one of the most thickly peopled and highly developed parts of North America. Instead, its mouth is in a region which has little attraction for men and industries. In the direction of its flow the great river has two components—one eastward and one northward; the former gives it its chief usefulness, the latter imposes a serious limitation upon that usefulness. I have often wondered what differences in international boundaries, what differences in the course of history in Canada and the United States, might have resulted if the St. Lawrence had continued to flow through the Hudson-Mohawk Valley as it did at one stage of the Glacial Period.

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## THE NEW YORK STATE BARGE CANAL*

By WILFRED H. SCHOFF
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On the basis of direct return, the State of New York cannot expect to receive a profit as it did from the old Erie system, because of the constitutional provision that prohibits the levying of tolls. The return from the present investment of $140,000,000, or thereabouts, must come in the general stimulation of industry and commerce, and in the influence brought to bear in reducing the cost of freight delivery, not only to the port of New York, but to and between all the traffic centers along the waterway system. The short line railroads between New York and Buffalo pass through no such chains of thickly settled communities as have been built up along the line of the Erie Canal. In 1898, when the committee on canals submitted its report, it showed assessed valuations in counties adjacent to the canal and Hudson River amounting to $4,412,000,000 as compared with only $485,000,000 in counties not adjacent, or 90.07 per cent. of the total assessment for the canal counties. This condition has been accentuated in recent years with the building of railroads paralleling the canal. In 1870, for example, the percentage was 87.7 for the canal counties; in 1880, 85.0; in 1890, 85.1. Of the total population in New York State in 1898, 82.2 per cent. resided in the canal counties, and this proportion is practically the same today. These figures clearly explain the over-

* Concluded from pp. 321–333 and 498–508.

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whelming vote by which the State Legislature decided to undertake the reconstruction of the canal. This same condition provides the strongest foundation for the belief that a large tonnage will be developed on the new Barge Canal system from its own territory, and that the utility and advantage of the canal is in very little measure dependent on the through traffic from lake to seaboard which originally provided the greater part of the canal tonnage.

The growth and decline of the Erie Canal tonnage has been discussed in this paper (pp. 326-327). The traffic steadily grew until the banner year of 1872, remaining at about the same level for the following decade, and subsequently falling off until in 1913 the traffic had fallen to a lower figure than that reported for

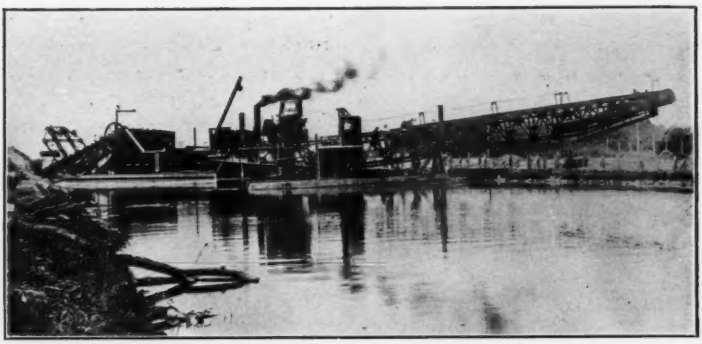

FIG. 13—Barge Canal excavation. Ladder dredge and conveyor.

1850. It is only fair to remember, however, that canal statistics during the period of reconstruction have very little bearing on the question of its traffic value. Since the work of reconstruction began, many barges have become worn out and barge owners would naturally not invest money in replacing them until the full dimensions of the new waterway should become available.

As already noted, the new Barge Canal system has been calculated on an assumed traffic of 10,000,000 tons per year, with a maximum capacity around 20,000,000. Yet even these maximum figures seem almost insignificant when compared with the railroad freight tonnage of New York. In 1890 the canals of New York carried only 9.3 per cent. and in 1898 only 5 per cent. of the tonnage. The railroads were carrying all but a small fraction of the grain and flour and nearly three-fourths of the lumber. In other words,

before New York State embarked in the Barge Canal enterprise, the Erie Canal had not only ceased to be a factor of importance in the export grain trade, but its tonnage had fallen below that of nearly all the railroads having New York terminals. The same condition was shown by the Buffalo figures of movement of food-stuffs. These facts reflect a general change in the economic condition of the country. While in the earlier years western grain was raised chiefly in areas within easy access of the Great Lakes, and naturally sought the lake route for shipment, the subsequent settlement of great wheat areas in the western and northwestern states developed a traffic which in any case required a long rail haul, and for the moving of which the lake route could offer less inducement. This traffic might go all rail to New York, or it might be deflected to seaports nearer the interior, such as Philadelphia and Baltimore, or in less degree Charleston, Savannah and New Orleans. On the other hand, the rapid increase in size of the lake freighters brought about a greater saving for the water haul on the lakes than for the eastern section of the water haul by canal, so that the several railroad lines operating between Buffalo and New York made great inroads into the canal tonnage. That these conditions tended to deflect a great tonnage from the port of New York is evident from the following table:

FLOUR AND GRAIN MOVEMENT TO ATLANTIC AND GULF PORTS
In thousands of bushels

| | Total New York | New York Canal | Canal Per Cent. | Other Ports | Total |
|---|---|---|---|---|---|
| 1870..... | 69,921 | 37,491 | 53.6 | 61,077 | 130,998 |
| 1880..... | 169,042 | 69,440 | 41.1 | 170,775 | 339,868 |
| 1890..... | 122,013 | 30,185 | 24.7 | 140,690 | 262,704 |
| 1898 ..... | 195,407 | 19,407 | 10.0 | 278,494 | 473,902 |

These figures explain the importance of canal efficiency as regards New York's position in the export grain trade, and the keen interest of the commercial bodies of New York City in supporting the canal reconstruction movement.

But the export grain trade no longer holds its former importance. Corn, by far the largest grain crop in the United States, has always been consumed chiefly within our own borders, going abroad only to make good shortages elsewhere. In 1913, for example, of the total production of 3,124,000,000 bushels, only 50,000,000 went

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abroad. The wheat crop, formerly one of our chief items of export, is being absorbed at home in increasing measure, and our available export balance is now hardly more than half that of fifteen years ago.

The general relation of the Erie Canal to our railroad systems is vastly different from that of earlier years. In 1870 there were in the United States less than 53,000 miles of railroad; in 1912 the mileage was 258,033. Of this great mileage a large proportion is little interested in the lake trade, but the greater part of it, in some way, is in physical connection with the port of New York. The rapid growth in efficiency of the railroad systems is also evident. In 1910 the freight carried on railroads in the United States amounted to 1,849.9 millions, or practically treble the figures of 1890. Within the same period the general tendency of freight cost was downward. This increased efficiency in railroad transportation is the result of extensive reconstruction of lines and of the great improvements made in motive power and steel freight cars of large capacity, so that the positive restraining influence of water competition is less marked than formerly. In 1910 the all rail rate on wheat, Chicago to New York, had fallen to 9.6 cts., lake and rail 6.57 cts. and lake and canal to 5.13 cts., leaving a balance of only 3.47 cts. per bushel in favor of the water route, a margin which might be wiped out by many other elements entering into the final cost of delivery.

The traffic figures of any important railroad system show that the way traffic far exceeds the through traffic; the local business is what keeps the railroad going, and indeed often provides the means of carrying the through business at competitive figures. The tonnage of an average system competing as to fairly fixed areas of business with other systems, is naturally larger within its own territory than in territory supplied from competing systems. The Pennsylvania Railroad system reports more than 90 per cent. of its total business, way traffic; the New York Central, over 80 per cent. and so on. The same tendency, although naturally in less degree, is shown by the figures of Erie Canal traffic. In 1898, the year of the canal committee's report, which showed the through traffic cut in two, the way traffic had fallen off much less, figures being 1,573,227 for the through business and 1,786,836 for the way. It was this condition which led the committee to predict:

"The local tonnage on the canals has for many years exceeded the through tonnage, just as it does on the railroads, although not to the same extent; and an enterprising transportation line, skillfully managed, could give an enormous

development to this local traffic at profitable prices, and thus be in position, just as the railroads are, to carry through freight of low grade at cost or less in case of necessity.''

It is a remarkable fact that, with through business on the old Erie Canal almost at the vanishing point, with all barge construction held up until the new canal system shall be ready for service, the internal movement has continued to increase, showing a gain in the past decade of about 50 per cent., thus fully bearing out, under the most adverse conditions, the committee's remark:

''The canals have been largely limited in the past to the lower grades of freight, and this is equally true of transportation on the lakes. There is no reason why the canals, if enlarged and properly managed, should not compete for the higher grades of freight, which, at prices far below those charged by the railroad, would bring very profitable returns on the lakes and canals. * * * With the canal enlarged so as to carry boats of 1,000 tons each assembled in fleets of four or six, with detached mechanical motive power, it will be possible to send a boatload of freight of the highest or lowest class through from any point on the lakes to any point on the Atlantic Coast.''

New York State has fully appreciated the importance of the way traffic on the Barge Canal system by providing for the construction of public water terminals at many points along the canal and at tide water, thus facilitating free delivery of freight to or from canal barges. It is reasonable to expect that New York, through the traffic developed within its own borders, will find itself amply justified for its great expenditure in Barge Canal reconstruction. But there are other important sources of tonnage. The transportation of building materials of all kinds, of bricks and coal products generally, produced in great volume in the Hudson Valley, of cement, sand, lime and lumber (even of Pacific Coast lumber coming through the Panama Canal), of pulp-wood from the Champlain district in Canada, marble and other stone from the same region, and iron ore from nearby mines, will all contribute largely. Indeed, the delivery of Lake Superior ore at tide water where it can be most economically used in connection with the Cuban, Chilean, Spanish, Swedish and other foreign ores, may give a positive advantage to tide-water steel plants, and the developmnt of such plants along the waterways between Raritan and Newark Bays is highly probable.

Finally, it is as an essential link in a much larger system that the New York Barge Canal must also be considered. Pursuant to acts of Congress the Army Engineers have completed surveys for an intracoastal waterway system to provide barge transportation along the entire Atlantic seaboard between New England and Florida, so

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that barges of standard dimensions passing through New York may continue through Long Island Sound to New Haven, New London, Providence, Fall River and New Bedford, and through the new Cape Cod Canal even to Boston; while in the opposite direction such barges will pass from Raritan Bay across New Jersey to the Delaware River and Bay, thence across the Delaware and Maryland peninsula to Chesapeake Bay, and from Hampton Roads into the sounds of North Carolina and out into the Atlantic Ocean at Beaufort Inlet below Cape Hatteras. This will ultimately be a sea-level protected passage of twelve feet depth, the same as the New York canals, and it will be extended through the southern thoroughfares

FIG. 14—"A miniature Culebra Cut" by which the Barge Canal leaves the Mohawk River to reach the Waterford locks.

and perhaps even to the southern extremity of Florida on somewhat smaller dimensions, the depth recommended being 7 feet owing to the smaller tonnage and the difficulty of maintaining deeper channels in the southern sounds.

This is a large undertaking and there is reason to believe that Congress will provide for continuing the work until it is finished. Thus the entire Great Lakes traffic will be extended through the Barge Canal up and down the Atlantic seaboard, so that the barge laden with southern pine may deliver its cargo in Boston or Providence, in Albany or Buffalo, while steam coal and anthracite now taken on ocean barges from Norfolk, Newport News, Baltimore and

Philadelphia for coastwise delivery, would be available at water freight rates for interior delivery, stimulating industry.

There is reason to believe that the Barge Canal will rank permanently among the world's busiest waterways. The communities that will be chiefly benefited are those within the boundaries of New York State, but the entire Great Lakes and St. Lawrence region and the Atlantic seaboard will be helped and stimulated. As a regulator of freight rates the Barge Canal will perform important service. Even though rail rates, through increased efficiency of operation, have steadily declined and the margin between rail and water rates is less than it was, it is the water competition that still de-

FIG. 15—Siphon lock, Oswego, N. Y. Barge Canal entrance to Lake Ontario.

termines the rate. Without an Erie Canal, rates between New York, Buffalo and intermediate points would never have fallen to their present level, and if the canal were closed, they would surely tend to rise. This would mean deflection of tonnage to other ports, at the expense of New York.

By its reconstruction of the Erie Canal, therefore, the State of New York is assuming a great liability in the belief that by stimulating commerce in many states it will gain for itself an important share of the resulting benefit, and on the assurance that any less generous policy on its part would tend to divert to other states commerce which it expects to retain for itself.

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## THE AMERICAN INDIAN TO-DAY*

This book gives a comprehensive view of the Indian tribes as they now are, and enough of their history to explain their present condition. It maintains that ignorance and maladministration have marked the conduct of Indian affairs; that there are still tribes which need the care and protection of a strong and righteous parent; that because the past has been discreditable there is the more reason why increased vigilance should now be exercised. Mr. Moorehead, as a member of the United States Board of Indian Commissioners, has had ample opportunity to study the conditions of the Indians and he speaks with knowledge and authority.

The Indian population in 1913 was 330,639, and the census shows that, during the past sixty years, these aborigines have not decreased so rapidly as has sometimes been stated. The table, however, includes a great admixture of people of foreign blood, a condition which arises from the marriage of white men and Indian women in order that the former may share in the allotment of funds and lands which the Government has set aside. No tribe is increasing, the Navahos excepted, save in the mixed-blood element. The Navahos are the only Indians in our country who have retained their customs and ceremonies and have consistently refused to marry outside of the tribe. The lands allotted to them lie in the famous Painted Desert region along the Colorado Canyon in which neither timber lands nor agricultural tracts exist and where, as Mr. Moorehead remarks, "fortunately, no mineral deposits aside from coal have been discovered" (p. 242). And yet in this area, where there is pressing need of a more widespread distribution of water and where projects for increasing the amount of grazing lands must be undertaken in order to give the Navahos a chance to develop their own civilization, attempts are being made constantly to limit still further the reserve allotted to the tribe.

*Protection of the Indians.* One of the serious charges made by Mr. Moorehead as to our Indian policy is that the Indian has not been protected against unscrupulous white men. This fact has resulted in disaster under various guises:

1. In cases of crime the Indians are not always treated with the same consideration that a white man expects. The importance of the crime is often magnified and the tribe is considered responsible for the act of the individual. In 1913, a violent speech was made in Congress against the Navahos, in which the Indians were charged with making raids upon the whites and murdering numbers of them. There seems to have been no evidence to substantiate this allegation and it was apparently made for no other reason than to discredit the tribe. In Utah recently a young Piute chief killed a Mexican sheep-herder. The sheriff's posse set out presumably to take vengeance on all Indians. It met a

* The American Indian in the United States. Period 1850-1914. By Warren K. Moorehead. The Present Condition of the American Indian; His Political History and Other Topics. A Plea for Justice. 440 pp. Maps, ills., index. The Andover Press, Andover, Mass., 1914. $3.75. 10 x 7⅛.

party of Indian men, women and children, and opened fire, killing, among others, a woman and a child. It is not surprising that this action aroused the Indians to the point of protecting themselves. The incompetence of the posse was made clear when General Scott, with no show of force, went to the Indians and persuaded them to yield up the criminals, offering no inducement other than a fair trial.

2. The drink habit, introduced by white men and too willingly embraced by the Indians, has been used as a source of profit, and the law of Congress that no liquor should be sold or given to the Indians has been widely ignored. The result has been much degradation. Deputy marshals who received a sum in cash for every Indian arrested in drink made a business of giving whisky to the Indians. It is reported that every adult male Indian on the White Earth Reservation in Minnesota was taken to St. Paul on drunkenness charges and that for every man the deputies received a bonus. In many other cases, on this reservation, Indians who had received allotments of valuable timber land were made drunk and then made to sign papers which deeded their land away from them. The Indian Appropriation Bill (H. R. 20150), which the last Congress passed, set aside $125,000 for suppressing the liquor traffic among Indians; and the Joint Commission to investigate Indian Affairs reported to the Senate on March 3, 1915 (*Congress. Record,* Vol. 52, 1915), that "it appears to your Commission that this evil can only be overcome in any community where a healthy sentiment exists or is created among both the Indians and the whites. It is a regrettable fact that in some localities the commercial profits arising from the sale of liquor to Indians appear to have rendered certain elements of the white population indifferent to the enforcement of the anti-liquor law."

3. Stealing the property of Indians is an almost unbelievable chapter in our dealings with them. The idea of allotting valuable land to the Indian whereby he may become self-supporting and gradually fitted for assimilation into the body politic was intended to benefit the race; but the opportunity it afforded for dishonesty seems never to have been anticipated. When the allotment of pine lands in the White Earth district was being made in 1905 many Indians were forced out of their tracts by fraud. Mr. Moorehead says (page 70) that the first to receive a share of the land was Margaret Lynch, a young white girl who had no right to an allotment. The father of the girl refused $22,000 cash for the land the next day. Some 500 Indians received no land and those who did receive tracts were eventually cheated out of them. Within four years most of the pine lands was found to be in the possession of large lumber companies and the best of the agricultural lands were controlled by local bankers or wealthy men of St. Paul and Minneapolis. The methods taken to get the lands away from the White Earth Indians were so gross that they could be practiced only with the connivance of the Government's local agents. One girl received $130 when the sum due her was $750; a woman sold a million feet of pine timber for $10,000 and went home with a thousand one-dollar bills; another Indian sold 70,000 feet of pine timber valued at nearly $1,000 and all he received was $10. Then, when the Indians had received money, means were invented to get the money from them. An Indian, who had received $7,000, bought a shack for $1,800, the sum of $400 was charged for moving it across a railroad track, and he was advised to open a store for which he was induced to give $1,500 for flour and feed which he never received.

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In Oklahoma a worse state of affairs existed. In some cases Indians were poisoned, or confined in rooms until they signed away their property. Minors and incompetents were easily swindled. A pauper child in an almshouse was found, on investigation, to have had a valuable allotment which the guardian disposed of for $50,000 and appropriated the money to his own use. In many cases, the good intentions of the Government have been the cause of pauperizing the Indians. The Government has not acted with great insight in administering the appropriations. A comparison with the Canadian plan of allotments, in which all incentive to fraud has been removed, emphasizes this fact. The Canadian Government gives tracts of land to the Indians but withholds the deeds, so that the lands cannot be sold or mortgaged, with the result that the Indians of Canada seem to have been better cared for than those in the United States.

4. Another vicious scheme was that of lending money to the Indians at an extremely high rate of interest. Here again, the charge against the Government relates not to its activity but to its passivity. The Indian was left a free agent to fritter away his property and to be a legitimate prey to unscrupulous men. One example from the Report of the Joint Commission to Investigate Indian Affairs (*Congress. Record*, Vol. 52, 1915) will suffice. Enormous sums, derived from royalties, etc., have been paid to the Osage Indians of Oklahoma. Congress enacted laws requiring such payments, but making no provision for the protection of the Indians. The result is that they have been victims of the grossest fraud and extortion. The Joint Commission discovered that white persons were loaning money to these Indians to tide them over to the next payment and the lowest rate of interest mentioned was 40 per cent. per annum. The Senate Committee on Indian Affairs inserted in the Indian appropriation bill, recently passed, an item which allows the Secretary of the Interior to withhold payments of royalties when it is seen that the money is misused or squandered and to use the funds for the benefit of the individuals.

*Industrial Conditions.* The Indians of the plains, hunters by adaptation, are now quartered on reservations where they are expected to practice agriculture. The change has been too rapid. A race cannot throw off one way in life and put on another as one changes a coat. The Government realized that many of these Indians knew nothing about agriculture, and arranged for the instruction of the various tribes by special teachers. The *Report* of the Joint Commission says, however, that this branch of service discloses "apathy and inefficiency in many of the field employees," and that the progress in agriculture and stock-raising on the reservations is a negligible quantity. The *Report* also condemns in severe terms the demonstration farms connected with large Indian schools. "By way of illustration, the school farm, comprising 176 acres, at Carlisle, Pa., from statements made by the school farmers themselves has been used to penalize refractory pupils rather than to demonstrate scientific agriculture. In this way work on the school farm has been made odious, so that instead of being a means of encouraging industry, it has seemed to have served the contrary purpose. Our attention has not yet been called to a demonstration farm connected with any Indian school which we believe is accomplishing material good by affording practical instruction to Indian pupils in scientific farming."

The new appropriation bill has allotted $600,000 for the encouragement of agriculture and stock-raising at the different reservations. There is little doubt

that the Indian must find his salvation in this line of work as a basis, but the expenditure of the appropriations must be wisely administered, and care and patience must be exercised not to force the Indian too suddenly into the new surroundings.

*Health and Sanitary Conditions.* The Indian of the plains or the woods, living in the open and dwelling in the tepee, made himself a symbol of physical fitness and strength. Erect, full-chested and lithe of limb, he was a noble specimen of humanity. In the change of environment, crowded into narrower confines and forced to live in inadequate dwellings, the present condition of the Indians is a sad commentary on the processes of civilization. The result has been an enormous increase of tuberculosis and trachoma. It is reported that 25,000 Indians are suffering from the former disease and the estimate is probably too small, for in some tribes fully 30 per cent. of the members are afflicted, while a much greater percentage, running as high as 70 per cent. in a few instances, are trachomatous. This condition arises primarily from a change of environment, from dropping a tried manner of life and assuming another without knowing the dangers. Our people have not fully realized their responsibility in this matter. Along with the forcing of civilization upon the Indians should have gone a system of education along sanitary lines. Against the spread of diseases the fight has not been vigorous. Appropriations have not been adequate for the improvement of sanitary conditions; and the large sums, $300,000 for relieving distress and preventing diseases, $100,000 for sanitary conditions and $45,000 for sanatoriums in the last Indian appropriation bill show the costliness of this neglect. Every effort should now be made to combat the scourges which have ravaged them. The Navahos have been more left alone than any other tribe and only about 10 per cent. of them have tuberculosis as against 69 per cent. in Oklahoma. Most of the cases unfortunately can be traced to the schools, where the disease was contracted and the children sent home to die without medical attendance.

*Education.* In the proper solution of the education of the Indian lies the largest factor in the advance of the tribes. There is evidence to show that many schools are being conducted along the best lines and that the many mistakes of the past are being eradicated. The facilities for education in some localities are meager owing to the sparse distribution of school children, as in the Painted Desert region, yet about 40 per cent. of the $11,255,000 of the last Indian appropriation bill was for educational purposes. The great need is for the Indians to be thoroughly grounded in the rudiments of sanitation; secondly, they should receive industrial education, especially in agriculture, which must be for some time the primary occupation of the tribes; and, finally, there is need of enough common school subjects to enable the Indians to appreciate and take care of their resources. There has been a tendency to carry education too far, to force the Indian in this as he has been forced in other lines, but a saner view obtains to-day, and when the movement against unsanitation and lack of medical inspection in the schools is completely successful, this work will be of the greatest aid to the Indians.

*Mr. Moorehead's Recommendations.* Mr. Moorehead suggests two plans for greater efficiency in our Indian administration (p. 431):

1. When a thoroughly competent man occupies the position of Commissioner of Indian Affairs, he should continue in office for ten or fifteen years.

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The frequent changes in this office have been detrimental to the Indian, and, furthermore, the office is a political one, so that a new incumbent has to investigate conditions anew and generally gets no further. Four men have been in this position since 1907 and no man can do much with so large a problem in so brief a time of service.

2. Mr. Moorehead, however, favors the plan proposed in the Lake Mohonk platform of October, 1913. It advocates a paid National Commission of seven men to devote their whole time to the work, assume entire control of Indian affairs and take them out of the sphere of politics. The commissioners would divide the work among them, one in charge of education, another of health, and so on. The Philippine Commission, with the work divided among the members of the board, has not only been eminently successful but has attracted wide attention because of its efficiency. There is already a Joint Commission to investigate Indian affairs, a Board of Indian Commissioners appointed by the President and serving without salary and a Commissioner of Indian Affairs, now Cato Sells of Texas. When it is considered that the Indian property to-day is valued at over a billion dollars and that nearly twelve million dollars is the appropriation for Indian affairs, it can be realized that the financial side of the question is no bagatelle. There is great need for a thorough understanding of the whole Indian question by a far-seeing and competent board which shall inaugurate and carry out a policy that shall do away with selfishness, corruption and inefficiency and start the Indian along the road to citizenship.

While this is being accomplished, there is a large field of useful service for charitable and philanthropic organizations. Mr. Moorehead regrets that the same interest which is felt towards Dr. Grenfell and his Labrador work cannot also be shared with the Indians. A knowledge of the story of the Indian to-day should be salutary, although the subject must necessarily cause a feeling of shame among all Americans; and this volume presents the story in a frank and convincing manner. In it there is no narrow prejudice and no pet theories, but an unvarnished account which should arouse the interest of the whole nation in the welfare of our Indian wards. ROBERT M. BROWN.

# GEOGRAPHICAL RECORD

## THE AMERICAN GEOGRAPHICAL SOCIETY

**Professor Vidal de la Blache receives the Daly Medal.** The Hon. William G. Sharp, the United States Ambassador to France, in behalf of the American Geographical Society, presented the Daly Medal to Professor Vidal de la Blache, the distinguished French geographer, on June 24. The presentation took place at Ambassador Sharp's house in the presence of ten or twelve of Professor de la Blache's confrères. Details will be published in a later number of the *Bulletin*.

## NORTH AMERICA

**Our National Forests.** Secretary of Agriculture Houston has adopted regulations for administering the new law which provides that national forest land may be leased for summer home sites and other recreational purposes in tracts of five acres or less for periods not to exceed thirty years. More than 2,000 cottages have been built in the forests by summer residents under the permit system which has now been supplemented by the new law. In 1914, farmers and local settlers of all classes who needed timber for their own use in the construction of houses, barns, fences, etc., were given free more than 120,000,000 feet of national forest timber, while about 14,000,000 feet were sold to settlers, ranchers and others at cost prices. (*Amer. Forestry*, June, 1915, pp. 737-747.)

**Yosemite National Park.** The Department of the Interior is distributing free its pamphlet "The Yosemite National Park. Season of 1915" to all who write for it. It gives the latest information as to the park, its survey, waterfalls, big trees, routes, hotels, camps, literature, etc. The fact seems not generally to be considered that the Yosemite National Park is not identical with the famous Yosemite Valley; in fact, the valley is a very small part of this great public pleasure ground.

**The Century Atlas to be Sold as a Separate Volume.** The Century Atlas and the Cyclopedia of Names, which are part of the Century Dictionary and Cyclopedia, have heretofore been sold only in connection with that work. As the atlas has been one of the most complete and authoritative atlases for popular use published in our country, the fact that it could be obtained only by purchasing the dictionary has been regretted by geographers. They will be pleased to learn that the Century Company has just announced that the Atlas and the Cyclopedia of Names are now to be sold as separate volumes.

**Progress of the Reclamation Service.** The *13th Annual Report* of the Reclamation Service (1913-1914) says that during 1913 the production on the areas already reclaimed by water exceeded $15,700,000 in value. In the spring of 1914 additional areas of heretofore untilled land were brought into productive condition. In the twelve years since the passage of the Reclamation Act 1,300,000 acres of land have been reclaimed. The work has been planned to reclaim at least double this area. As the farmers till more land it will be possible, with relatively less additional cost, to extend or complete the details of construction until nearly 3,000,000 acres have been supplied with water. Alfalfa is the basis of success in all the projects with clover next among the hay crops. Among the grains, wheat, oats and barley are of greatest importance. Substantial areas of fruit are also grown on a number of the projects, notably in Arizona, Colorado and Washington. An advance in intensive farming is shown by the increased acreage devoted to vegetables and other crops requiring great care and attention. Potatoes are widely produced and sugar beets have become a highly important crop. In 1913 about 90 per cent. of the irrigated area was cropped. At the present time no irrigation systems of large importance are being planned and built. There are many projects, but they are halted for lack of funds. Most of the *Report* is devoted to the details of the work done and its results.



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**Work for the Betterment of Alaskan Natives.** About 25,000 native Alaskans are scattered in small villages along the thousands of miles of coast line and on the great rivers of Alaska. The latest government report on the work done in their behalf (*U. S. Bureau of Education Bull. No. 31,* 1914) says that 77 schools were maintained in the villages during the fiscal year ending June 30, 1913, and that the enrollment was 3,563 pupils. Every teacher is a social worker, who, in addition to performing the routine work of the school room, is expected to promote, in every possible way, the physical, moral and industrial welfare of the adults as well as the children. The aim is so to instruct the children as to help them to live comfortably and to deal intelligently with those whom they meet. Instruction in carpentry, cooking and sewing is emphasized. Each school house is a social center and many of the buildings contain, besides the recitation room and industrial room, kitchen, rooms for the teacher and a laundry and baths for the native community.

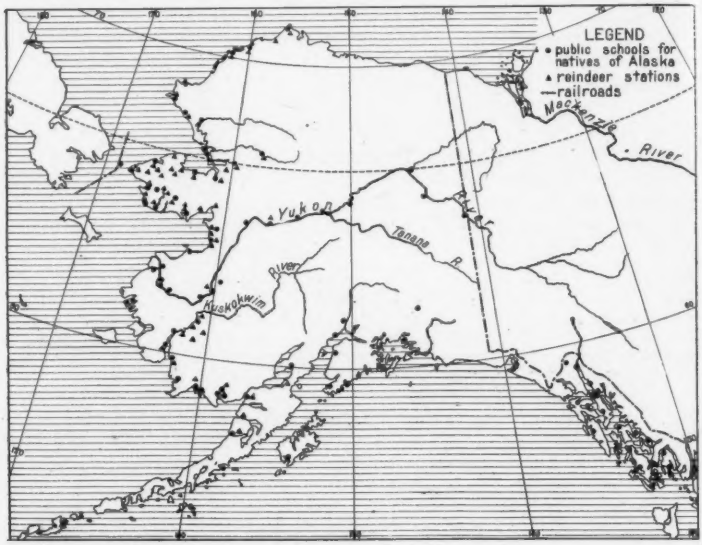


FIG. 1.

Reindeer herding has within ten years become a large, wealth-producing native industry in northern and western Alaska. The 30,532 reindeer now owned by the natives are worth $763,300. The income of the natives from this industry during the year was $66,966 exclusive of the meat and hides used by the natives themselves.

The Bureau of Education is now encouraging the establishment of coöperative stores and enterprises owned and managed by the natives themselves. They are thus relieved of the burden of the middleman's profit, can secure necessaries at the lowest prices and at their own stores obtain fair value for their furs, ivory, baskets and other native products. A number of these stores have been established and are doing well.

The territorial legislature has made school attendance obligatory upon all normal native children between the ages of eight and sixteen residing within one mile of a public school. Provision for the medical and sanitary relief of the Eskimos, Indians, Aleuts and other natives of Alaska is imperative. Detailed reports by teachers, superintendents and the public health service conclude the report.

**Warm and Cold Winters in the Eastern United States.** A study of the conditions which produce warmer and colder winters in the eastern United States (*Monthly Weather Review*, Vol. 42, 1914, pp. 672-675) leads Professor W. J. Humphreys to conclusions which throw light on the possibility of long-range seasonal forecasts. The character of the winter of the eastern United States, whether that be mild (marine) or severe (continental), is largely determined by the location and development of the Bermuda "high." If this high be persistent, we have unusually mild conditions, as, we may note, was the case two winters ago. If the high is absent, exceptionally low temperatures prevail. The cause of the Bermuda high seems to be a minimum surface temperature of the water along the tropical high pressure belt, and this low temperature may depend upon the temperature and the strength of the Labrador current. If this be so, gaugings of this current ought to furnish some basis for forecasting the character of the weather in the eastern United States, perhaps two weeks or a month in advance. This study by Professor Humphreys is along lines similar to those followed so successfully by Meinardus, Pettersson and others in Europe. It is, doubtless, in connection with such correlations as these that our hope of long-range forecasts lies. R. DEC. WARD.

**Snowfall of the Eastern United States.** Dr. Charles F. Brooks, of the U. S. Bureau of Plant Industry, has made a notable contribution to American climatology in his detailed and critical study of the snowfall of the eastern United States (*Monthly Weather Review*, Vol. 43, No. 1, 1915, pp. 2-11). The average monthly snowfall (inches) from September to May is shown in a series of nine original charts. There are also original charts of the average mean annual snowfall (inches) for the period 1895-1913; the average number of snowfall days (inches); and the directions of the snow-bearing winds from December to March (monthly charts). The text contains several diagrams giving details regarding the monthly distribution, and the average, maximum, minimum and extreme range of annual snowfall about the Great Lakes (1895-1910). It appears that the average distribution of snowfall in the eastern United States is controlled by the temperatures and the amount of moisture. The lake region, the Appalachians and the North Atlantic coast have the heaviest snowfall. The snowfall of the northwest is moderate because of the deficiency of moisture. Topography and the exposure to moist winds locally modify the amounts of snowfall. The northeast wind, being both cold and damp, is the wind which brings the great snowstorms over nearly all of the eastern United States. The northwest wind is generally dry, and therefore usually brings only snow flurries, except locally on windward slopes or in the lee of the Great Lakes. R. DEC. WARD.

**Educational Geography.** Three of the courses offered at the summer session of the University of California this summer are devoted to the geography of California and the Pacific Coast. Associate Professor Ruliff S. Holway lectured on the physiography of California and conducted a field class in physiography for the observation and interpretation of topographic forms as illustrated in the vicinity of San Francisco Bay. Mr. Cary T. Wright, Instructor in Economics, had charge of classes on commerce of the Pacific and physical geography in the high school.

The department of Botany in the University of Chicago will give a course in field ecology in Northern Michigan, to be conducted by Dr. George D. Fuller, from about July 25 to Sept. 1.

One of the features of the University of Oregon summer school this year was a nature study expedition by mountain trail with pack animals from Eugene, the seat of the University, to Crater Lake. Professor Albert R. Sweetser (Botany) and Professor Warren D. Smith (Geology) accompanied the party and gave daily talks on their subjects. The region traversed was of especial geological and historical interest. It was there that the Modoc Indian wars were fought to the south of Crater Lake. The Department of Geology has been giving a course in geography during the past semester. This will probably be made a full year course next year and will hereafter be a required study in the School of Commerce. The basis of the course was a study of the resources of Oregon, but

lectures were also given on mathematical geography, oceanography, political geography, distribution of religions, geography in history, and the geography of some of the most important commodities. Each student was required to prepare a thesis covering the various economic resources of the State.

## SOUTH AMERICA

**Appointment of a Boundary Commission in Venezuela.** A note communicated on February 28, 1914, by the Chilean minister at Caracas to his government and reproduced in the *Boletin de Relaciones Exteriores* (December, 1914, p. 25), announces the appointment of a Venezuelan boundary commission to be known as the "Comisión Topográfica de Fronteras." The compilation of a boundary map and the maintenance of boundary posts and monuments is entrusted to the Commission, which will also undertake economic surveys of the Venezuelan frontier.

**Economic Effect of the War on South America.** The interdependence of economic conditions the world over is well illustrated by the effect of the war on South America. In Argentina foreign trade was seriously hampered by the suspension of traffic by the German steamship lines and the partial interruption of service of the British, French and Italian lines. The tonnage of in- and outgoing vessels for Buenos Aires in August, 1914, amounted to 188,000 tons as compared with 312,000 tons for August, 1913. In August and September, 1914, only 177 foreign vessels entered this port as against 327 during the same months of 1913. Scarcity of coal also reduced the amount of railroad and river traffic. In Chile, early in the war, the nitrate plants practically suspended operations. This led to a congestion of unemployed in Santiago and other cities, which delayed a full resumption of activities, when adjustment had been made to the new conditions. The rise in the cost of living was partially met by temporarily revoking the import duty on Argentine cattle. Advances in the cost of food also occurred in Brazil and were accentuated by the interruption of coastwise trade. But the main hardship has been the reduction in the customs revenue. In Argentina the income from this source from January to September, 1914, was 60,000,000 pesos less than for the corresponding period of the preceding year, and the budget deficit for 1914 is estimated to be 80,000,000 pesos. (P. Gast, in *Weltwirtschaft*, March, 1915.)

## AFRICA

**Along the Congo-Zambezi Water Parting.** The *Geographical Journal* (June, pp. 536-538) presents a sketch map and notes received from Mr. T. S. Schindler, who has made several trips along the extreme northern extremity of the Zambezi system. This region is not only interesting as the divide between two great river systems, but is also attracting attention as the natural route for the railroad, now partly constructed, to connect the great mining region of southeastern Katanga with the port of Lobito in Angola, thus providing the shortest and best route for transporting these minerals to the sea. Mr. Schindler says that agricultural development will result from the completion of the railroad. The population is comparatively large. Cattle do well and there seems no doubt that wheat may be cultivated on this higher land in the dry season by irrigation. Most European vegetables will grow and the large variety of vegetables, and fruits raised by the natives thrives finely. The rainfall is adequate and amounted in the last wet season to over 52 inches, which is probably below the average.

## ASIA

**The Continental Shelf of the Northern Indian Ocean.** In a recent number of the *Beiträge zur Geophysik* (Vol. 13, 1914, No. 5-6, pp. 349-384, with Pls. IV and V) G. Ziemendorff discusses the continental shelf of the northern part of the Indian Ocean. The title, "Der Kontinentalschelf des Indischen Ozeans," is somewhat too promising, as the paper, due to the insufficiency of the source material, deals only with that portion of the coast which extends from the island of Socotra to the mouth of the Ganges. The first part of the paper

consists of an exclusively descriptive discussion of the altitude and width of the continental shelf along this coast, based on the British Admiralty charts, which is accompanied by a valuable series of profiles, 100 in number. Among these are the five showing the submarine valley of the Indus in cross-section. Its general configuration is indicated in the following table, adapted from the one given in the paper.

SUBMARINE VALLEY OF THE INDUS

| Off-shore distance of profile | Width of valley | Maximum depth of valley bottom under sea level | Mean depth of valley bottom under continental shelf |
|---|---|---|---|
| 9.3 miles | 4.7 miles | 420 ft. | 289 ft. |
| 20.8 | 5.6 | 1050 | 771 |
| 32.6 | 11.8 | 1847 | 1621 |
| 45.7 | 9.9 | 1020 | 764 |
| 73.0 | 12.4 | 3786 | 3143 |

The valley lies off the Vatho mouth of the Indus and extends in a south-southwest direction. Its width is a marked feature, as the above table shows. At the third and fifth profiles it is about as wide as the Connecticut Valley at Springfield. Its *talweg* lies nearer the western side. The occurrence of a submarine threshold about 45 miles off shore is evident from the table; the depth here rises to 767 feet from a depth 950 feet greater.

In the second part of the paper the structural relations of the continental shelf to the coast are somewhat superficially discussed. Here again, it is India which engages our attention. Conditions on the west and on the east coast are strongly contrasted. The west coast is accompanied by a wide, the east coast by a narrow shelf. The outer border of the west coast shelf is almost rectilinear between Karachi and Cape Comorin and thus attains great width where the coast recedes, as at the Gulf of Cambay: here it is over 200 miles wide. Its mean width is about 60 miles. On the east, from the Ganges delta to Cape Comorin, the shelf closely accompanies the coast; its mean width is about 16 miles. This condition is the opposite of what might be expected, when it is remembered that the peninsula is almost wholly drained to the east. The sediments of such rivers as the Cauvery, Kistna, Godavari, and Mahanadi might be expected to enlarge the continental shelf. Instead they actually encroach upon it, so that here we have the unusual case of a coastal shelf being diminished by sedimentation. The rivers do deposit a load commensurate with their size, but in the form of an alluvial coastal plain, and it is this which is being built up at the expense of the coastal shelf. The author has therefore measured the width of the coastal plain and added it to that of the coastal shelf; the total gives an average width of about 43 miles, which does not contrast so greatly with that of the west coast. Given the known fact that the geology of the area at the time of the formation of the continental shelf was essentially as it is now, the author sees in these conditions confirmation of the belief, held, among others, by Oldham, that the west coast is sinking while the east coast is rising.

## AUSTRALASIA AND OCEANIA

**The Coast of New Caledonia.*** The mountainous island of New Caledonia, a French colony, nearly 250 miles in length, lying northeast of Australia, is remarkable for the extensive system of barrier reefs by which it is enclosed. Its well-embayed coast line testifies to recent submergence and thus supports Darwin's theory of coral reefs; but in one respect the coast of this island is strikingly exceptional: its southeastern end and much of its northeastern side are cut back in strong sea cliffs, 500 or 1,000 feet in height, from which a second exceptional feature is to be inferred, namely, that no coral reefs enclosed this part of the coast while the cliffs were cut. The period of cliff cutting must have been about as long as, and contemporaneous with, the period of valley erosion; but since the valleys were eroded they have been transformed into bays by partial

* Abstract of an address by Professor William M. Davis, in April last, at the meeting of the Association of American Geographers and the American Geographical Society in New York City.

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submergence; hence the cliffs also must be partly submerged; the base line of the cliffs along the former shore, like the stream lines at the former valley mouths, must now lie several hundred feet below sea level; in this third peculiarity New Caledonia resembles Tahiti, but differs from other Pacific islands. Finally the last phase of the submergence, by which the cliff base-line and the valley mouths were drowned, involved a rapid subsidence preceding the process of the present period, for the small sea cliffs, lately cut by the waves of the reef-enclosed lagoon, are fronted by a flat platform, the width of which is about as great as the height of the small cliffs.

**The Future of the Solomon Islands.** *Tropical Life* for April, 1915, contains a short paper with this title in which an account of the islands is given and their importance for the production of copra is described. The soil is very fertile, volcanic in origin, mixed with coral limestone; and with the rainfall averaging 90-200 inches and a very humid climate, the cocoanut palm flourishes and bears very heavy crops. Some 25,000 acres are now under cocoanut plantations in the various islands. The palms come into bearing early, and the writer records that he saw a tree under six years old bearing considerably more than 300 nuts, which is by no means a record for these islands. As the Solomon group lies on the direct route between Australia and the Philippines and Japan, its importance is likely to increase in the near future.

## EUROPE.

**The Geography of the North Sea Region.** An interesting lecture on the geography of the North Sea by Dr. A. Merz before the Berlin Geographical Society on April 10 is reported by Professor O. Baschin in the May number (Vol. 3, No. 20) of *Die Naturwissenschaften*. The economic importance of this favored region is shown by the following illuminating facts. From the lands bordering the North Sea come one-third of the world's coal production and one-half of the iron output; one-half of all the cotton manufacturing of the world is centered in this region, whose fifty harbors are the ports of origin of about one-third of the world's shipping; and its waters supply one-fifth of the total fishery output of the world.

The remainder of the lecture dealt mainly with the North Sea itself and its coasts. The area of the continental shelf of western Europe is given as 540,000 square miles, including the 121,000 square miles of the British Isles. The area of the North Sea is given as 220,000 square miles, if its seaward limits, as Dr. Merz proposes, be considered to lie, in the south, at the Strait of Dover, in the north, along a line connecting the Orkneys with the Shetland Islands and the mouth of North Fjord on the Norwegian coast (62° N.); and in the east, on a line running from Cape Skagen, the northernmost point of Denmark, northeast to Mollösund on the Swedish coast, thus including the Skager Rak. The two openings through which the North Sea communicates with the ocean (Strait of Dover, 20 miles wide; Peterhead-Stavanger opening, 280 miles wide) admit the warm currents from the Atlantic, thus preventing any of the ports from becoming ice-bound in winter. These facts, added to the location of the North Sea near the pole of the land hemisphere, supply the physical basis for the commercial preeminence to which this origin is predestined by the above-mentioned economic conditions.

The coasts of the North Sea belong to various physical types. The coast of Denmark, Germany, Holland, Belgium and the northernmost part of France is a dune coast, characterized by a dune wall of greater or less elevation behind which extend the marshes whose depression below high water mark has necessitated the construction of dikes. While this dune wall is continuous on the Danish and Belgian coasts, it is interrupted at frequent intervals on the German and Dutch coasts. Back of the fringe of barrier beach islands thus created lie funnel-shaped estuaries leading to large rivers which drain an important hinterland. The conditions are thus present for the growth of great harbors. In Holland the two most important ports, Amsterdam and Rotterdam, lie more than 12 miles from the coast and are connected with the sea by canals at whose mouths lie respectively Ymuiden, the fishing center, and Hook of Holland, the

starting point for steamship lines to England. The only harbor of importance on the Belgian coast is Ostend, which is kept open artificially and access to which is impeded by the Flemish Banks. West of Calais the low dune coast gives way to a steep cliff coast formed by the truncation of the Cretaceous and Jurassic ridges which, prior to the Glacial Period, connected England with the Continent (the North Downs on the English side, the Collines de l'Artois on the French side).

The British North Sea coast clearly reflects the structure of the islands. Alternate hard and soft bands of rocks are truncated obliquely by the coast, so that by wave and tide action deep bays have been eroded into the softer rocks, thus affording the conditions suitable to the development of harbors. Thus the Thames estuary is eroded into the soft Tertiary rocks of the London Basin. Farther to the north the coast of Suffolk and Norfolk is a cliff coast accompanied by shoals, so that only small fishing towns have developed. To the north, the reentrant of the Wash breaks through the Cretaceous cuesta and penetrates far inland. It shallows into mud flats, bordered by marshy fens, similar to the "watten" and "polders" respectively on the landward side of the Frisian islands. The next indentation is the Humber estuary. The fact that it carries ocean navigation 14 milees inland and forms the gateway to the rich agricultural section of York and the industrial region of the midland counties explains the development of the important harbors on its shores, Hull, with a population of 300,000, and Grimsby, with 70,000, the latter a fishing center deriving its wealth from the Dogger Bank fisheries. To the north the coast becomes steep and rocky. The coal-bearing series here strike the coast, forming the foundation of the prosperity of the Tyne ports. Twenty million tons of coal are mined annually in this district. Newcastle, with 500,000 inhabitants, is also the center of the ship-building industry of England with its 34 plants.

In Scotland steep abrasional coasts prevail; the principal indentation is the Firth of Forth, with numerous coal harbors, on which also lies Edinburgh. The Norwegian coast presents a totally different type. Here the fiords predominate, long, deep and narrow arms of the sea which penetrate as much as 100 miles into the highland. Their origin is often due to structural lines; their formation mainly to glacial erosion during the Ice Age. The accompanying coastal terrace which has been broken up into numberless skerries is the main seat of the population. The inhabitants are chiefly sailors and fishermen.

**Isomeric Rainfall Maps of the British Isles.** A contribution to our knowledge of the rainfall of the British Isles, by Dr. H. R. Mill and Mr. Carle Salter appears in the *Quarterly Journal of the Royal Meteorological Society*, Vol. XLI, 1915, pp. 1-39. Reference is made to the earlier work of Gaster (*British Rainfall*, 1867 and 1868) and of Mellish, who submitted to the Society in 1900 maps showing the percentage of annual rainfall in each season for the period 1866-1890, and was probably the first to treat the matter cartographically. The results obtained by these earlier authors are now largely confirmed, but it is shown that ten years is too short a period for variations due to exceptionally wet months to be smoothed out. The period now considered is 35 years, 1875-1909, and the number of stations used was about 300, distributed as uniformly as possible. This period, although not fixing the monthly averages, probably indicates the normal type of seasonal march. The average monthly rainfall is expressed as a percentage of the average annual fall at each station, and the results are shown cartographically in twelve monthly and four seasonal charts, which are termed *isomeric*, the lines upon them indicating equal proportions of the annual average fall. The most interesting features are the occurrence of two types of seasonal march. The western, or wet, districts, have a maximum fall in winter and a minimum in summer, while the eastern or dry districts show a maximum in summer and a minimum in winter. The equinoctial maps show the transitional stages between these two extremes, the spring months having everywhere a low rainfall, and small range, with a central maximum inland and a peripheral minimum around the coast, and the autumn months a large rainfall with a central minimum and a peripheral maximum. There is strong evidence for believing that the seasonal march depends upon the geographical position of the station.

R. DEC. WARD.

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**Oceanic Researches at a Standstill.** Prof. Otto Pettersson, the Swedish oceanographer, has been appointed President of the International Oceanographical Investigations Committee, to succeed Dr. Rose, who resigned because of the war. A plan of work had been mapped out for the various countries participating, but since the war began the investigations have come to a standstill. Sweden, however, has mapped out some work for the season 1915-16. (*Geogr. Zeitschr.*, Vol. 21, 1915, No. 5, p. 293.)

**Winter Weather as a Factor in the War.** In the paper with this title read in April at the joint meeting of the Association of American Geographers and the American Geographical Society, Professor R. DeC. Ward said that Gen. von Hindenburg's great advance in East Prussia early in February would have been far more successful if the frost and hard ground, which favored the German movement at the start, had not been followed by an unexpected and general thaw, resulting in muddy roads, difficult marching, and consequent delays. The two jaws of the German trap failed to meet at the right time, and through the opening a large part of the Russians escaped. In the mud of Poland the heavy, low German armored motors, built for use on hard roads, had often been almost or quite useless, while the lighter Russian motors, built for use on soft ground, had proved far more serviceable. In the wintry gales over the Channel and the North Sea, England had her most valuable ally against a general Zeppelin raid. It was significant that every German air raid had been made at the time of a fog. In all these cases the German airmen escaped from their pursuers by reason of the fog. The naval operations in the Dardanelles had shown striking dependence upon weather conditions. The first engagement took place in fine weather, but operations were later suspended several times on account of bad weather. The storms which caused the trouble belong to a type which is most frequent in spring, and would diminish as summer advanced. Egypt owes its remarkable immunity from outside attack to its strategic position in the desert. A strong Turkish movement, with heavy artillery, to the Suez Canal, was bound to be difficult and slow. Any serious assault of this kind was to be discounted in advance. A spell of foggy weather, which had apparently been accurately forecasted by the German meteorological observers in Belgium, was chosen for the German naval raid on the east coast of England in mid-December.

In most wars, in our latitudes, spring has brought many of the greatest battles and much of the fiercest fighting. The outburst of military activity in the spring is the natural response to the more genial conditions, when the ice and snow are gone; when the roads are drier, transportation is easier, sickness and suffering less. As the winter of 1914-15 merged into spring, and the spring into summer, it was to be expected that the war would be waged with renewed energy and that the fighting would be fiercer and more disastrous than any that had preceded.

**Meteorological Activity in Germany.** The annual Report of the operations of the Prussian Meteorological Institute (Berlin, 1915) brings evidence of the effects of the war in decreasing the number of the regular staff of officials. More than half the men employed at the central office of the Institute have gone to the war, some as members of the military weather service. The work at the central office and, to a less extent, at the Potsdam Observatory, has suffered in consequence, but in the main the regular activities have been continued. The next year's work will, however, show more marked effects of the war, according to the Director. Many of the observers at stations of the upper classes have gone to fight, but substitutes have, in most cases, been found, so that, up to the time of preparing this report, few series of observations have been broken, except along the Russian frontier. A large number of rainfall and of thunderstorm stations have, however, necessarily been abandoned.

In the usual appendix, containing scientific memoirs, the papers of most general interest are those by Dr. Hellmann, on the construction of rainfall charts, and one by Dr. Arendt on thunderstorm rainfalls.

In a recent number of the *Abhandlungen* (Vol. V, No. 2, 1915) of the Prussian Meteorological Institute, Dr. Hellmann presents a complete classification of all forms of condensation and precipitation. This is a very useful discussion.

R. DeC. Ward.

## GENERAL

**Deserts.** In a paper entitled "Deserts" (*Scott. Geogr. Mag.*, Vol. 31, 1915, No. 5, p. 241) by Prof. J. W. Gregory, he says that deserts are not absolutely unreclaimable and many once desert areas are now in profitable occupation owing to a better knowledge of how to use their slight and irregular rainfall. When suitably watered, deserts may be extremely prolific; for their soils are often rich in immediately available plant foods which have accumulated during a long period of rest. Desert soils especially accumulate salts of potash and lime, which would be leached out of them by a heavier rainfall. The desert soils, moreover, are often very deep, and their crops are nourished from an unusually thick layer.

## PERSONAL

Dr. Hermon C. Bumpus, formerly Professor of Zoology at Brown University and later Director of the New York Museum of Natural History, was installed as President of Tufts College on June 12.

Dr. William H. Dall of the U. S. Geological Survey and the Smithsonian Institution and Mr. Otto H. Tittmann, recently Superintendent of the U. S. Coast and Geodetic Survey, received the degree of Doctor of Laws at the recent Commencement of George Washington University.

Dr. R. M. Harper carried out his principal field work this year in February and March, in central Florida, where he gathered additional data for his report on the geography and resources of that section. His report is likely to be published next winter.

Professor D. W. Johnson of Columbia University has been elected President of the Physiographer's Club of New York for the ensuing year. The club held a field meeeting on the Palisades, north of New York City, on Saturday, June 5.

Professor H. G. Lyons will be President of the Section of Geography at the meeting of the British Association for the Advancement of Science at Manchester, England, September 7-11.

Mr. F. H. Newell, who was consulting engineer of the U. S. Reclamation Service and Director of the Service, 1907-1914, has accepted the position of head of the civil engineering department of the University of Illinois. His address is 1109 California Street, Urbana, Ill.

Assistant Professor George E. Nichols of Sheffield Scientific School, Yale University, is continuing this summer his work on the ecology of the vegetation of northern Cape Breton Island which he began last year.

Edward Van Dyke Robinson, Professor of Economics in the University of Minnesota, has been appointed Professor of Economics in Columbia University with special oversight and direction of the teaching of undergraduates. Professor Robinson was graduated from the University of Michigan in 1890. He took his Ph.D. at Leipzig in 1895.

## OBITUARY

WALTER JENNEY. Mr. Jenney, President of the Appalachian Mountain Club, died on May 3. He was an original member of the club and served as Vice-President in 1912-1913 and President in 1914-1915.

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# GEOGRAPHICAL LITERATURE AND MAPS

## (INCLUDING ACCESSIONS TO THE LIBRARY)

## BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch)

### NORTH AMERICA

**The End of the Trail.** The Far West from New Mexico to British Columbia. By E. Alexander Powell. xv and 463 pp. Map, ills., index. Charles Scribner's Sons, New York, 1914. $3. 9 x 6.

The trip was made in an automobile, the overworked machine, however, giving out entirely a little before Port Rupert, Canada, the new port in British Columbia, was reached. Mr. Powell outlines routes covering many hundreds of miles which the motorist may follow with profit and pleasure. He found a great deal of interest in regions that cannot be seen from car windows or hotels. He is a traveler of world-wide experience, a writer who is never dull, and his book is adapted both for entertaining reading at home or for practical usefulness along the routes it covers.

**The Yellowstone National Park.** Historical and Descriptive. By Hiram M. Chittenden. New and enlarged edition. vii and 350 pp. Map, ills., index. Stewart & Kidd Co., Cincinnati, 1915. $1.75. 8 x 5½.

The second edition of this book, with the many improvements made in it, will be heartily welcomed. The author, a brigadier general, U. S. A., retired, was long assigned to service in the park in exclusive charge of the work of constructing the fine system of roads that have so much enhanced the pleasure of travel in this wonderland. General Chittenden knows the park if anyone does, and his book is the most authoritative, complete and helpful of any in the market. There is practically nothing relating to the park of interest to intelligent readers that is not treated in this volume. No one can take the usual five-day trip through the park without being wonderfully helped by reading the book; and it will be even more helpful to those who are so fortunate as to make a longer sojourn.

**The Glacier National Park.** A Popular Guide to its Geology and Scenery. By Marius R. Campbell. 54 pp. Maps, ills. *U. S. Geol. Surv. Bull. 600.* Washington, 1914. 9½ x 6.

The increasing number of travelers who wish to know something about the origin of natural scenery will welcome Campbell's popular guide to the geology and scenery of the Glacier National Park. The author has aimed to present in non-technical language such aspects of the physical history of this region as will enable the layman to appreciate more fully the significance of the ridges, peaks, valleys, lakes, cascades and other elements of Glacier Park scenery. No one should find it difficult to follow the author in his explanation of the mountains of the Park as a part of the stratified crust of the earth which has been bent up and finally pushed many miles out over the Great Plains district to the east, then maturely dissected into ridges and valleys by rivers, and later greatly modified by glacial action. With these broader features in mind, the tourist may then traverse any one of the principal valleys of the region with the guide in hand, and find on the proper page an explanation of the special features of that particular valley. A contour map,[1] with shading to bring out the relief, accompanies the report, which is further illustrated by admirable photographs of typical scenery.

[1] Reviewed in *Bulletin*, April, 1915, p. 313.

Scientific readers will find an occasional point to criticize, as, for example, the author's statements to the effect that ripple marks, sun cracks, rain prints, and casts of salt crystals prove that the beds containing them were laid down in large lakes, or in the sea. Such a point is of minor consequence, however, in a paper successfully designed to serve the needs of the non-scientific public.

D. W. JOHNSON.

## AFRICA

**Tourist's Guide to the Island of Madeira** (A Pearl of the Ocean). Compiled by C. A. le P. Power. 72 pp. Maps, ills., index. G. Philip & Son, Ltd., London, 1914. 3s. 6d. 7½ x 5.

Compiled for those who want a simple guide to places of interest on the island. Three maps aid the text. Besides detailed descriptions of excursions, there are a table of elevations, explanations of place names, a list of hotels, advice for forecasting weather conditions, etc., and 64 small photographs of Madeira scenery.

WILBUR GREELEY BURROUGHS.

## EUROPE

**The Bronze Age in Ireland.** By George Coffey. xi and 107 pp. Ills., index. Hodges, Figgis & Co., Dublin, 1913. 6s. 10 x 6½.

A scholarly, archæological brochure descriptive of the tools, weapons, burial implements, and domestic utensils, unearthed in Ireland, and belonging to the age of bronze. The writer adopts the view of archæologists, that the period of the Bronze Age extended from about 3000 B. C. to 900 A. D. He also maintains the common opinion that the Neolithic, Copper, Bronze and Iron Ages were not sharply marked off from one another, but were successively developed from each other, in the order named. He thinks that the metallurgy of the Bronze Age advanced into Ireland from Mycenæ, by the Danube and the Elbe.

DAVID H. BUEL.

**The Exploration of the Alps.** By Arnold Lunn. (Home Univ. Library.) 256 pp. Index. H. Holt & Co., New York, 1914. 50 cents. 7 x 4½.

In medieval times some men loved the Alps, but more hated them. The first important Alpine peak to be climbed was Rochemelon, 11,600 feet high. The feat was accomplished by a knight, Rotario of Asti. As time went on, more explorers came and the Alps were gradually opened up. Mr. Lunn tells of this, and of the scientific discoveries of Agassiz, Perrandier, and others. But mountaineering did not become a fashionable sport until the English came in force. "From 1840 the number of Englishmen taking part in high ascents increased rapidly; and between 1854 and 1865 the great bulk of the virgin ascents stand to their credit." The story of the Matterhorn and of the terrible disaster there is told graphically. Mr. Lunn also describes recent mountaineering, the charm of the sport in winter, and the advantage of skis. He discusses the best writings dealing with the Alps, and the sensations these mountains produce upon the beholder. A useful bibliography complete this thorough and interesting book.

WILBUR GREELEY BURROUGHS.

**Rambles about the Riviera.** By Frances M. Gostling. xiv and 326 pp. Ills., index. James Pott & Co., New York, 1914. $2.50. 9 x 5½.

Jottings from an English wife's note-book of an autumn, out-of-season tour with her husband, through the Riviera. The places visited, the historical allusions, the quaint peasants' lore, the Christian legends of the Saints grafted upon the old pagan myths, are described in an entertaining manner. The author says: "It was customary for proscribed persons, in times of persecution, to take refuge among the tombs, and thus the catacombs became the resort of the first Christians." It would be truer to say that, as burial associations were recognized as legal corporations under the Roman Civil Law, the primitive

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Roman Christians, whose cult was outlawed by the law of the land, made use of such incorporation to hold legal meetings, and so, under the guise of burial associations, celebrated their worship in the Catacombs. DAVID H. BUEL.

**The Geological Formations of the Balaton Lake Region and their Regional Forms of Stratification.** By Louis de Lóczy. 617 pp. Maps, ills. Balaton Commission of the Hungarian Geogr. Soc., Budapest, 1913.

A valuable addition to the scientific investigation of Balaton Lake. It is the 31st part in the series which is expected to give a complete monography of that part of Hungary. Geography, geology, botany, zoology, mineralogy, petrography, history, archæology, etc., are all represented in the publications of the "Scientific Investigation Committee of the Balaton Lake" section of the Hungarian Geographical Society.

The Balaton Lake region is a very complicated, faulted mountain area. Stratigraphically it contains deposits of Archæozoic age, very few Palæozoic specimens, but especially Mesozoic and Cenozoic sediments. The Triassic is here described in great detail with the aid of a very large number of fossil species. The Pliocene also is thoroughly treated, as well as the volcanic action of Pliocene time; and basalts, geyserites, etc., are thoroughly discussed.

Apparently this is one of the finest examples of a faulted block mountain region. It is expected that the German edition of the work will be published this year. The geomorphology of the region by the same author and the hydrography by Dr. Eugene de Cholnoky, now in preparation, will help us to a complete understanding of that part of Hungary.

MICHAEL HALTENBERGER.

## THE WORLD AND PARTS OF IT

**Agriculture in the Tropics.** An Elementary Treatise. By J. C. Willis. (Cambridge Biological Series). 2nd edit. xvi and 223 pp. Ills., index. University Press, Cambridge. G. P. Putnam's Sons, New York, 1914. 9 x 6.

The white powers, Mr. Willis says, now control the bulk of the tropics. The northern peoples, therefore, should understand the agricultural problems of the tropics. At present the tropical area given to export products is about fifty million acres, and the area used to feed tropical peoples is about 275 million acres. Still not more than half the available land is used, while much that is cultivated is worked very inefficiently. Thus the question of tropical agriculture is momentous.

The author deals with the problem clearly. He considers the soil, climate, population, laborer, transportation, capital, drainage, irrigation, crops, etc. He describes each of the principal agricultural products, its cultivation, etc., in detail. He discusses agriculture in its relation to the native population. The methods of opening an agricultural estate in the tropics are mentioned; and lastly, Mr. Willis outlines an agricultural policy for the white nations holding tropical lands by which agriculture in the tropics may be improved. The book, which is well illustrated, is written in a popular, non-technical, though thorough manner. WILBUR GREELEY BURROUGHS.

**Oceanographische en Meteorologische Waarnemingen in den Indischen Oceaan,** Dec., Jan., Feb., 1856-1910. 25 charts. Kon. Nederl. Meteorol. Inst. [Public.] No. 104. Versluys & Scherjon, Utrecht. 14½ x 22.

The meteorology of the Indian Ocean has been very thoroughly studied. In addition to the monthly meteorological charts of this area, issued by the British Meteorological Office, the Deutsche Seewarte and our own Hydrographic Office, we have the well-known Indian Ocean Atlas of the Deutsche Seewarte, and the Meteorological Atlas of the Indian Seas, published by the Meteorological Department of India. The newest publication, issued by the Meteorological In-

stitute of the Netherlands, gives us, in an admirable series of twenty-five charts, the results of observations made during December, January and February, for 1856-1910. These charts show for each of the three months, the currents, winds, general circulation of water and air, isobars, isotherms (air and water), sailing routes, cyclonic tracks, and limits of fog, ice, trades and monsoons. There is descriptive text, in Dutch, with some of the charts. R. DEC. WARD.

**Kulturbeziehungen zwischen Indien, Orient und Europa.** Von Dr. Georg Wilke. (Mannus-Bibliothek). iv and 376 pp. Ills., index. Curt Kabitzsch, Würzburg, 1913. Mk. 12. 10½ x 7½.

This is the tenth of the valuable monographs of the Mannus-Bibliothek, each a monument of research relating to prehistoric man. This volume comes in close succession upon Dr. Wilke's study of the oriental associations of the megalithic culture of southwest Europe and continues his researches into the neolithic period. Dr. Wilke devotes considerable attention to human teratology and its direct influence upon human beliefs and its later and indirect influence upon art. I would not seek to contravene his mature judgment upon this point, yet it may be not without interest to cite my own experience among savages whose culture plane at the present day can vary little from the culture plane at which our ancestors once stood in our prehistory. My experience has shown me that the birth of the human monster is far more public with the savage than with the civilized. It may be that in refined obstetries arising out of the modern acquisition of the *schamgefühl* (for neither modesty nor sense of shame quite conveys the sense) publicity is shunned in our society more than in the all-nude life of the savage. It may be, it probably is, the case that in the unguarded life of savagery, women are brought more often to term with mutilated product. Yet despite the frequency or at least the publicity of the monster type, I can see among the savages of the ruder Pacific no such influence upon belief or upon art. I do not know of a single instance of design traceable to the teratological motive in the carving and painting of the Solomon Islanders, to take an example which is doubly of the best, for I am familiar with many cases of monstrosity in that society, and their art is very vivid in representing the most common things. Furthermore, in my collection of Samoan traditional history, a most considerable volume soon to be elaborated, I recall but two instances in which teratology can be traced; one is the wife-search of the son of the King of Manu'a, whose body ceased downward at the sternum; the other is the occurrence of a misbirth in the lineage of the Kings of Atau (Tui-Atua). The father, Mata'utia Fa'atulou wedded Levalasi; there was born to them a blood clot, to which was given the name Tui-Atua Tuimavave, but in his stead was adopted the lady Salamasina, who became the great queen under whom Samoa was first united. This note is disproportionate in the review of a most valuable book, but I am sure that Dr. Wilke will welcome such a comment upon his theme.
WILLIAM CHURCHILL.

## PHYSICAL GEOGRAPHY

**The Quaternary Ice Age.** By W. B. Wright. xxiv and 464 pp. Maps, ills., index. The Macmillan Co., New York, 1914. $5. 9 x 6.

The table of contents includes: glaciers and ice sheets; glacial drifts; glaciation of the British Isles; Pleistocene deposits of Great Britain; the preglacial raised beach and associated deposits; glaciation of Europe, the Alps and North America; Quaternary lakes of America; the loess; Quaternary mammals; Quaternary man; theories of the ice age; the astronomical theory; late Quaternary oscillations of level in Fennoscandia; raised beaches and submerged forests of the British Isles; late glacial changes of level in North America; the isostatic theory of the Quaternary oscillations of sea level; postglacial changes of climate in Northwest Europe.

The opening chapters present the well-established facts of glaciation and prepare the reader for the more technical problems and discussions that follow. The descriptions of Great Britain, largely devoted to England and Scotland, are, of course, especially full and complete. Naturally, the account of Alpine glaciation is summarized from Penck and Brückner's monumental work, which

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is inaccessible to many students because of its size and cost. Still more useful is the author's summary of the researches of De Geer, Brögger and their Scandinavian coworkers whose papers are inaccessible to most students. Perhaps the most interesting citation is the account of De Geer's study of the laminated lake clays by which he estimates the distance of annual glacial retreat at various points and arrives at an estimate of 9,000 years since the ice left Stockholm.

The loess appeals strongly to the author's interest and he finds the evidence overwhelmingly pointing to eolian origin. He tentatively regards the loess as a dry climate product. The chapter on raised beaches is splendidly illustrated and contains descriptions of features which the author has evidently studied at first hand. Of the various explanations of sea level offered he favors the depression of land by the weight of the ice and the abstraction of sea water by freezing into glaciers and the subsequent return of the water by the melting of the ice. The principal theories to account for the Glacial Period are given in outline, but the author holds that practically all are untenable. The final chapters summarizes the researches of Scandinavian geologists which tend to show a post-glacial mildness of climate followed by more severe conditions which perhaps still persist.

The literature of glacial geology is so vast that a book which summarizes investigation is welcome; moreover, the book contains many observations and studies by the author himself. The student will miss a more inclusive bibliography by which the source of all the references and drawings could be ascertained.

F. V. EMERSON.

**Igneous Rocks and Their Origin.** By R. A. Daly. 563 pp. Maps, ills., index. McGraw-Hill Book Co., New York, 1914. 9 x 6½.

When Bacon wrote that "Books must follow sciences, and not sciences books," which is another way of saying that nothing fresh ever gets into a book, he gave to most scientific writers an excuse, that they have not been slow to avail themselves of, for writing dull books; and not even John Tyndall's brilliant suggestions as to the "Scientific Use of the Imagination" have borne much fruit. In Professor Daly's book, however, we have something that would surprise Bacon, delight Tyndall, and appeal to the ancient Greek philosopher as eminently fit and proper, for he has even had the temerity to go to facts, to nature, if you please, for the verification of his theories, rather than for the suggestion of theory. His brilliantly speculative papers, that have been appearing for nearly a score of years, have prepared a hearty welcome for this book, that geologists, and especially teachers of the science, have awaited with keenest interest, feeling sure that he who reads with Dr. Daly can never run in a rut.

The author tells us that his "book is intended to summarize and correlate the facts known about igneous rocks, with special reference to their field relations," and he has performed well this task.

The work is divided into three parts. The first of these "considers the facts which need explanation in a philosophy of the igneous rocks;" the second gives the general theoretical conclusions reached as to the origin and mode of irruption and eruption of igneous rocks, what the author modestly calls an eclectic theory; and the third outlines the results obtained by the author in applying his general theory to the known facts.

In the second chapter of Part I the author discusses the classification of igneous rock species, rejecting the so-called quantitative system, "as being based on assumptions concerning chemical relations in magmas, as having little adjustability to newly discovered facts, and as disregarding in its grouping significant relationships and conspicuous differences among the igneous rocks." He adopts a slightly modified form of the Rosenbusch classification, that working geologists have found so satisfactory for more than a quarter of a century, giving it a quantitative character in a table showing the average chemical composition calculated for each rock type. The ten groups of his table, the author designates clans; as the "granite clan," the "gabbro clan," etc.; and the consideration of these clans in detail he defers to Part III of the book.

Next follows the classification of intruded bodies into A, injected masses,

and B, subjacent masses. Under A are included I, concordant injections (injected along bedding planes), as intrusive sheets, laccoliths, and phacoliths; and II, discordant, or cross-cutting injections, as dikes, necks, bysmaliths, chonoliths, etc. Under B are placed stocks and bosses and batholiths. Extrusive bodies are similarly classified as to form.

Part II considers the cosmical aspects of the earth, and discusses abyssal injection, magmatic stoping, magmatic assimilation, magmatic differentiation, and the mechanism of volcanic vents, closing with a summary of the author's eclectic theory.

The rocks passed in review in Part III are discussed in the light of this theory. COLLIER COBB.

**Syllabus of Historical Geology.** Columbia University, Department of Geology. By A. W. Grabau. 51 pp. A. G. Seiler, New York, 1912. 50 cents. 8 x 5½.

The division of historical geology into its three aspects of stratigraphy, paleontology and physiography forms the basis of the studies. Although the syllabus bears no reference to the relation between the first and last subjects, the order of succession may be taken to imply due recognition of interdependence. The course appears laid out according to established methods of ascribing paramount importance to paleontologic evidence as contrasted with the lithologic. While this is still natural in view of the mass of detail accumulated in the field of paleontology, the petrographic phases of historical geology should not be overlooked any longer. The terminology used is restricted to the more precise meanings evolved by modern demand for accuracy.

LEON DOMINIAN.

**Physical Geography.** By Philip Lake. xx and 324 pp. Map, ills., index. University Press, Cambridge, 1915. G. P. Putnam's Sons, New York. 9 x 6.

Intended for students who have had a course of general elementary science. It is assumed that the student understands the principles of the barometer and thermometer, and has some knowledge of the motions of the earth and the moon. The atmosphere, hydrosphere, and lithosphere are considered. Geological subjects not taken up in many physical geographies are included. Where the origin of a physiographic feature has not definitely been agreed upon by authorities the most important theories are given and discussed. In this connection the chapter on coral reefs and islands is of interest.

A feature of the work is the numerous sections, diagrams, etc., bearing on the text. Sections, especially if simple and well-drawn, always give the reader a clearer understanding of many problems in physiography and geology than any other method of visual instruction. WILBUR GREELEY BURROUGHS.

**Structural Geology.** By C. K. Leith. viii and 169 pp. Ills., index. H. Holt & Co., New York, 1913. $1.50. 9 x 6.

"The structural geologist," writes Leith, "has in recent years found it necessary in his field work to give much attention to the genetic relationship of rock structures produced by deformation. The student reads in general textbooks about individual structures, but seldom of their relations, with the result that at least in his early field work he may fail to utilize methods which are helpful or essential in the interpretation of the geology of a district. Emphasis upon geological structures as related parts of a record or process rather than as isolated facts determines the method of presentation in this book." He says that he was associated with Van Hise in the development of Van Hise's "Principles of North American Pre-Cambrian Geology," and that the book under consideration is partly a development and revision of the ideas of Van Hise's paper.

Among the subjects taken up are rock flowage, fractures, faults, structures common to both fracture and flow, types of mountains, major units of structure, ultimate forces of secondary deformation, isostasy being taken up in some detail, and unconformity.

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Leith says that he regards minor folds, as evidence of differential movement between beds, as one of the most fundamental principles in the field study of structures. He writes: "the position of the major fold is inferred from the differential movement indicated by the minor folds. The major fold may in turn be found to be one of a series of minor folds related to a still larger fold."

Numerous directions for field observations are given, such as relations of cleavage to folds, determination of top and bottom of sedimentary beds in a folded area, physical evidences of unconformity, etc. There also are many exercises for laboratory work. Photographs, sections, etc., aid the text. The book should be valuable to all interested in geology.

WILBUR GREELEY BURROUGHS.

## METEOROLOGY AND CLIMATOLOGY

**The Laws of the Evaporation of Water from Pans, Reservoirs and Lakes, Sand, Soils and Plants (Part 1).** The Definitive Formulas for the Evaporation of Water from Pans of Different Sizes, Lakes and Reservoirs. Studies on Evaporation from Soil, Sand, and Loam Planted with Wheat, Beans and Alfalfa (Part 2). By F. H. Bigelow, Argentine Meteorol. Office. Bulletin No. 2. 147 pp. Buenos Aires, 1912.

Professor Bigelow, of the Argentine Meteorological Office, is carrying on there investigations similar to those which he had previously undertaken in this country. Professor Bigelow discusses the apparatus for measuring evaporation; the several terms of the evaporation formula, and gives the computation-tables necessary for use in practical work, with examples to show the methods of computation. The results previously obtained in the United States are embodied in this report, as well as the later conclusions reached in Argentina. The practical bearing of these studies may be realized from the fact that Professor Bigelow has given tables for computing evaporation which require only that observations of the mean water surface temperature, the mean vapor pressure and the mean wind velocity, shall be available. Moreover, the thermometer readings need be made only to tenths of a degree (C.) and the anemometer readings to kilometers. Thus, as Professor Bigelow points out, "the entire work can be put on a basis easy for all classes of people." The text is Spanish and English.

R. DEC. WARD.

**Les Problèmes de l'Atmosphère.** Par A. Berget. 342 pp. Ills. E. Flammarion, Paris, 1914. Fr. 3.50. 7½ x 4½.

Professor Berget has tried to summarize, in compact form, the many important meteorological problems which await solution. His hope is that he may inspire others to study them, and to clear them up. The chapters deal with the following atmospheric relations: form, dimensions, composition, history, dust, optical phenomena, sound, radiation, temperature, pressure, circulation, water vapor, electricity, mechanics, utilization, and "the problem of the atmosphere." The historical development of each subject is emphasized.

Professor Berget's discussion is thoroughly up to date in almost every case, as, *e. g.*, in including reference to the dust of the Katmai eruption, and to the new C. G. S. units. One omission we regret to see—reference to the planetesimal hypothesis as to the origin of the atmosphere. In the chapter on sound, note is made of the interesting application of the laws of acoustics in confirming the existence of a discontinuous stratum at a height of 75-80 kilometers. Our author holds that both mechanical and thermal causes act together in the formation, maintenance and propagation of cyclones. The application of the mechanics of the atmosphere to the progress of aviation is considered. The great problem of the atmosphere is weather forecasting, both short and long range. We can recommend Prof. Berget's book as giving a broad view of many of the great principles and problems of modern meteorology, and as suggesting numerous topics for discussion in the class-room, and for investigation in the laboratory and outdoors.

R. DEC. WARD.

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**Suggestions for a Course in Climatology in correlation with Geography.** By Wallace E. Whitehouse. 31 pp. University College of Wales, Aberystwyth, 1914. 1s. 10 x 6.

Mr. Whitehouse's little pamphlet, with Dr. Shaw's suggestive preface, is evidence of an effort to enrich the British school course in geography and to make routine meteorological observations in schools alive and interesting. Directions are given for taking and compiling such observations, and for the use of the official publications of the British Meteorological Office. Under the heading of "School Climatology" are an outline of simple exercises, suitable for "laboratory" work, and lists of questions for observation and discussion. A good working bibliography follows. The larger world relations of meteorology and climatology are not neglected and our own teachers of geography will find many helpful suggestions in this pamphlet. R. DEC. WARD.

**Einige Bemerkungen über das Klima der historischen Zeit nebst einem Verzeichnis mittelalterlicher Witterungserscheinungen.** Von Arnold Norlind. 53 pp. *Lunds Univ. Arsskrift*, N. F., Afd. 1, Bd. 10, No. 1. Lund, 1914. 10 x 6½.

Norlind has performed a valuable service in collecting and judiciously sifting the climatic records contained in a large number of medieval documents. His data include the years from 700 to 1500 A.D., and pertain to the region from France to Poland with minor attention to Scandinavia, Britain, and Italy on the outskirts. He devotes twenty pages to a table showing the general character of each year, with references to the sources of information. His main conclusion (p. 18) is that the difficulty of comparing the different sources both qualitatively and quantitatively is such that no trace of a period larger than the Brückner cycle of thirty or thirty-five years can be detected. "Yet there seems to me to be perceptible an indication (wie eine Ahnung durchzuscheinen) that there was an insignificant increase of winter cold in comparison with the present conditions. That this was the case is perhaps indicated by the comparatively frequent accounts of the freezing of rivers, and sometimes also of the sea. A former more pronounced continentality of climate is also made probable by Otto Pettersson."

For the supposedly critical period from 1120 to 1310 A.D., Norlind makes a special study of the alternation of years with severe winters and dry late summers or autumns and consequent good harvests (continental) on the one hand, with mild winters with moist, cool summers (oceanic) on the other hand. He represents these conditions graphically (Fig. 1). Although he does not mention the matter, his curve of severe, continental winters goes up and down in close harmony with the growth of the trees of California. Equally significant is the fact that the fourteenth century was a time of unusually severe winters in Europe as well as of rapid tree growth in California. Nordlind finds that 1296, 1306, 1323, and 1408 are the years when a freezing of the Baltic Sea and Kattegat is most unquestionably established. Of these 1296 is "much the most uncertain," and 1323-4 the most severe. ELLSWORTH HUNTINGTON.

## ANTHROPOGEOGRAPHY

**Völkerpsychologie.** Eine Untersuchung der Entwicklungsgesetze von Sprache, Mythus und Sitte. Von Wilhelm Wundt. 1. und 2. Band: Die Sprache. 3. neu bearbeitete Auflage. 1. Teil, xv and 695 pp. Ills., index. 1911. Mk. 14. 2. Teil, x and 678 pp. Ills. 1912. Mk. 13. Wilhelm Engelmann, Leipzig. 10 x 6½ each.

Each new edition of Wundt is wholly a new work, for his research is so incessant, his discovery of new problems and settlement thereof is so keen, that it must tax his chirography to keep up with the activity of his brain. The great Leipzig student would be the first to disclaim the suggestion that he has here written a final word in the psychology of human speech. In fact, the subject has but lately come into consideration and we are yet groping for some acquaintance with its elements. We find great encouragement in the

fact that Wundt has come clearly to the conclusion that it is idle to look for the germs of speech-evolution in the inflected tongues. Such, in general, he employs solely as the more familiar examples whereby to illustrate each section of his theme; for the more weighty proof he is constantly citing the languages of far earlier type.

It is upon this lower plane of speech that we feel confident that the great discoveries of man-speech as a chapter in evolution are to be found, and that at no remote date; it is only through isolating speech that we are to find the growth of the possibilities of muscular control and conscious direction whereby man is first enabled to add the consonantal modulant to the open-throated vowel which is a part of his merely animal equipment. Already great steps have been taken in this direction in the last few years as a result of American research. We have no doubt that if Wundt's attention had been drawn to these American studies in time he would have leaped to the great discovery which now but awaits the proper presentation of the basic material. Groping for just this end, he has failed of the discovery solely because he has had to rest upon the earlier and improper classification of the Malayo-Polynesian languages and that, resting upon Humboldt's great treatise on the Kavi speech and Brugman's later comment thereupon, he has not known in the upper tangle of agglutination that underneath it lay a fertile field of isolating speech which would surely have led him to the discovery of a genesis of human speech. When the student to whom the comparative philology of this most complete family of isolating speech is familiar finds Wundt reaching always in that direction by a sort of prescient instinct and always held back by reason of the impossible compaction of agglutinative Malayan with the far simpler Polynesian, it must serve as a stimulus to the completion of the study of isolation so that speech may be lifted into its proper place in the doctrine of evolution.

When we recognize how much yet remains hidden from this great investigator we are amazed at the closeness of his approach with imperfect data to conclusions which we are sure will be firmly established on the better information soon to be placed within the reach of such scholars as he. If he can accomplish so much with the richness of the speech of isolation hidden from his view or presented in a distorted form, the possession of that material properly presented should lead to a philology all new.

This work is a monument of genius. The former volume deals with the growth and treatment of words as thought units, the latter with the association of such word units as component parts in the sentences wherewith the more complex thought associations are communicable. He follows a method whereby the inner impulse is discussed as manifest in a certain outward expression, then as reacting upon the inner original impulse as an exterior modifier which then leads to new or modified outward expression. Man makes the word, the word makes man, a constant play back and forth outward from within, inward from without.

WILLIAM CHURCHILL.

**Experimentelle Abstammungs- und Vererbungslehre.** Von Ernst Lehmann. (Series: Aus Natur und Geisteswelt.) xiii and 104 pp. Ills. B. G. Teubner, Leipzig, 1913. Mk. 1.25. 7½ x 5.

This new volume of the excellent Teubner collection of popular scientific monographs is based on a lecture course of the author on the same subject. Starting from the current popular ideas on evolution, it examines them in the light of experimental science, with a view to propagating more correct notions about the subject in a wider circle of readers. Only such facts and hypotheses are brought forward as can be claimed as safely established parts of modern science, even at the risk of omitting one or the other item of special scientific interest: a very wise limitation in a book written for lay readers. In this way the author discusses the growth of the idea of evolution from Linnæus to Darwin, the definition of species, variation, bastardizing, Mendelism, mutation, heredity, and similar problems. A number of typical drawings reproduced from standard works illustrate the text, and the appendix contains a good list of reference works.

M. K. GENTHE.

**Die geistige Kultur der Naturvölker.** Von K. Th. Preuss. (Series: Aus Natur & Geisteswelt.) 112 pp. Ills. B. G. Teubner, Leipzig, 1914. Mk. 1.25. 7½ x 5.

This is the 452d volume of the brilliant series of popular monographs of the primer type "Aus Natur und Geisteswelt," and it is the 452d proof of the enthusiasm and honesty of purpose which has kept this series true to its high scientific purpose. Such a primer on the spiritual interests of the primitives among men is designed for the general information of the educable class which has an interest in the higher things of life and lacks the time and means for recondite studies. The conclusions presented by Professor Preuss are all safe. His illustrations of points of belief and custom are almost wholly selected from the newer literature of ethnology, evidence that his work is quite fresh and original. He cites his authorities freely and thus points the way to further study.

WILLIAM CHURCHILL.

## ECONOMIC AND COMMERCIAL GEOGRAPHY

**The Coco Nut.** By Edwin B. Copeland. xiv and 212 pp. Ills., index. Macmillan & Co., London, 1914. $2.60. 8½ x 6.

The book gives evidence of thorough preparation and ample qualification, on the part of the author, for instruction in the cultivation of the cocoanut from the location of the plantation, selection of varieties for any required product, best methods of preparing the seed bed, caring for the trees through the several stages of growth and the control of diseases and pests to the maturity and full yield of fruit, as well as the preparation and utilization of the product in all of its forms.

The author points out that the cocoanut palm has supplied primitive man of the tropics with easily acquired food, drink, shelter, fuel and clothing besides having many minor uses. His book also shows the economic possibilities of marketing its various products.

The natural habitat of this tropical palm is on the plains and in the valleys near the seashore with a range of 20° on either side of the equator. The reader is impressed with the nicety of adjustment between sunshine, rainfall, temperature, atmospheric humidity and supply of ground water required for its growth, thus pointing the way to a scientific and sure method of locating plantations for the best economic results. The subject is treated from a business viewpoint and aims to inculcate successful methods in every stage of the business. While it is interesting reading for the layman, it should be carefully read by the experienced planter and studied in detail by the prospective cultivator. JOHN B. TORBERT.

**A History of Commerce.** By Clive Day. New edit. xliv and 640 pp. Index. Longmans, Green & Co., New York, 1914. $2. 8 x 5½.

A new and slightly revised edition of a well-known work. To bring the volume up to date there has been added a new chapter dealing with recent commercial development. The principal topics considered are the rise in the price level since 1896 and the contributory causes; the world's railroads and shipping; the share of the leading countries in the world's commerce; the trade of the United Kingdom; the development of German commerce; the relative importance of the internal and foreign trade of the United States; the growth of transportation facilities in the United States; changes in character of the export trade, and the development of American manufactures. The bibliography at the end of the text has been added to considerably by the inclusion of the titles of books published since 1907 which may be of service to the student or teacher of the history of commerce. AVARD L. BISHOP.

**Malaria, Cause and Control.** By William B. Herms. xi and 163 pp. Ills. The Macmillan Co., New York, 1913. $1.50. 8½ x 6.

The author says that while the mortality due to malaria is comparatively low it is one of the most expensive of diseases because of its continued weakening effect on the victim and its harmful influence on labor and real estate

valuation. The annual losses from malaria in the state of California is estimated at $2,820,400. The loss inflicted on one town is placed at $75,000 annually. Through an active anti-malaria campaign the number of malaria cases can be reduced in any given community 50 per cent. in the first year, 80 per cent. in the second, and 95 per cent. in the third year, these results being accomplished at an expenditure of about $2,000 each year. How to carry on a scientific and systematic crusade against malaria, the methods used, together with a complete treatise on the disease, is included in this practical and valuable book. WILBUR GREELEY BURROUGHS.

**The Fur Traders and Fur Bearing Animals.** By Marcus Petersen. 372 pp. Ills., index. The Hammond Press, Buffalo, N. Y., 1914. $3.50. 9½ x 6.

A compendium of information covering the whole field of the fur industry, valuable alike to the student, the dealer and the trapper. The introductory pages review briefly the history of the fur companies in North America, fur farming, fur markets and the preparation and marketing of the various furs. The material is loosely presented, but most of it is of worth; and especially valuable for the student are the tables of annual supply and the comparative lists of output and prices. The larger part of the book is a classified natural history of fur-bearing animals, but to the general description are added paragraphs which give the grades and values of the skins. ROBERT M. BROWN.

**Economic Geography.** By John McFarlane. viii and 560 pp. Maps, index. Pitman & Sons, London, 1914. The Macmillan Co., New York. $2.25. 8½ x 5½.

McFarlane's book attempts to divide the countries of the world into natural regions and to trace the influence of all the geographic conditions upon the economic life of man within them. This division of countries into natural regions is the feature of the work and a good one. The diagrams of regions are extremely suggestive to the geographer, perhaps with the exception of that of Siberia, and they must prove stimulating to the student. They are drawn only for Great Britain, France, Germany, Siberia, India, Canada, United States, Brazil, the Argentine, New Zealand, and Australia, the last one under the name of the "main geographical divisions of Australia," instead of "regions," as in the other cases. The subdivisions of Australia and of India are of unusual interest. The reviewer would like to see further attempts at outlining regions made.

Oddly, the book has neither date nor copyright notice. It certainly gathers much economic geography into compact, easily accessible form, and the facts are modern. The text is so largely a mass of brief statements of fact that it will be more comfortable to refer to it to ascertain a particular fact than to read it to acquire an understanding of relations. Of new relations, or newly put geographic concepts, the work seems to offer little. MARK JEFFERSON.

## HISTORICAL GEOGRAPHY

**The Golden Age of Prince Henry the Navigator.** By J. P. Oliveira Martins. Translated, with additions, by Jas. J. Abraham and Wm. E. Reynolds. ix and 324 pp. Ills., index. E. P. Dutton & Co., New York, 1914. $3.50. 9 x 6.

An English adaptation, the first ever attempted of the Portuguese classic, dealing with the personal history of the heyday of the Aviz dynasty, and the founding of the illegitimate house of Braganza. It is a tale, in the telling of which the golden age of Portuguese adventure and discovery has a large part. In that curious mixture of motives, so common at the time, geographical research, boldness of seamanship, commercial shrewdness, and religious fanaticism are interwoven. Prince Henry the Navigator stands out as the type of this spirit. He sacrifices wedded life, dynastic power, and military success, to an all-absorbing and all-consuming purpose to solve the geographical puzzle of the

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West African coast line and discovering by this route a way to India. Under his princely auspices African slavery was first introduced into Portugal, the Portuguese caravels pushed steadily southward along the African coast, past Cape Palmas, into the Gulf of Guinea, as far as 4° north latitude, and the way was paved for his pupil Magellan to sail around Africa to India.

DAVID H. BUEL.

**Lexique de Géographie Ancienne.** By M. Besnier. Nouvelle collection à l'usage des classes. xx and 893 pp. Librairie C. Klincksieck, Paris, 1914. 10 frs. 7 x 4½.

Although devised primarily to accompany Van Kampen's Atlas Antiquus, the work has exceeded its original scope to the extent of having become available for reference independently of any other publication. It is distinctive for the correlation of ancient place names with their modern form as well as for the citation of numerous sources in which geographical names will be found as they were used by ancient writers.

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## OTHER BOOKS RECEIVED

*These notes do not preclude more extended reference later*

### NORTH AMERICA

PERSONAL EXPERIENCES AMONG OUR NORTH AMERICAN INDIANS FROM 1867 TO 1885. By W. Thornton Parker. 232 pp. The author, Northampton, Mass., 1913. 9½ x 6½.

THE REAL UNITED STATES AND CANADA. Pocket Guide-Book. By William H. Black. (Nutshell Travel Series.) xlii and 305 pp. Maps, index. Association for New York, New York, 1915. $1. 6½ x 4½.

THE HISTORY OF NEW FRANCE. By Marc Lescarbot. With an English translation, notes and appendices by W. L. Grant and an introduction by H. P. Biggar. Vol. 3: xviii and 555 pp. Map, index. Champlain Society, Toronto, 1914. $5. 9½ x 7.

MOUNT VERNON. The Home of Washington. By J. E. Jones. 44 pp. Ills. U. S. Press Association, Washington, D. C., 1915. $1. 8½ x 6.

A NEW VANCOUVER JOURNAL ON THE DISCOVERY OF PUGET SOUND. By a member of the *Chatham's* crew. Edited by Edmund S. Meany. 43 pp. University of Washington, Seattle, 1915. $1. 10 x 7½.

WHEAT. A practical discussion of the raising, marketing, handling and use of the wheat crop, relating largely to the Great Plains region of the United States and Canada. By A. M. Ten Eyck. (Scientific Soil Culture Series, R. A. Haste, Editor.) 194 pp. Ills., index. Campbell Soil Culture Publ. Co., Lincoln, Neb., 1914. 7½ x 5½.

### CENTRAL AMERICA AND WEST INDIES

WEST INDIA SCENERY. 22 water-colour sketches made on voyages to and from the West Indies. By Frederick Alcock. With historical and topographical notes by H. J. B. Ward. 89 pp. A. Reid & Co., Ltd., Newcastle-on-Tyne, 1914 (?). 4s. 7½ x 10. [Graphic and not exaggerated descriptions of the islands from the scenic point of view. Finely illustrated.]

### SOUTH AMERICA

LANDESKUNDE VON CHILE (REPÚBLICA DE CHILE). Von Dr. P. Stange. (Sammlung Göschen). 116 pp. Map, ills. G. J. Göschen, Berlin, 1914. 90 pfg. 6½ x 4½.

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## AFRICA

BEITRÄGE ZUR KENNTNIS DES LEBENS DER MOHAMMEDANISCHEN STÄDTER, FELLACHEN UND BEDUINEN IM HEUTIGEN ÄGYPTEN. Von Friedrich Schwally. 44 pp. *Sitzungsb. der Heidelberger Akad. der Wiss., Philosoph.-hist. Klasse*, Abhandl. 17, 1912. Carl Winter, Heidelberg, 1912. Mk. 1.50. 9½ x 6½.

WAYFARERS IN THE LIBYAN DESERT. By Frances G. Alexander. ix and 257 pp. Map, ills. G. P. Putnam's Sons, New York, 1912. $2. 7½ x 5½.

KORDOFAN AND THE REGION TO THE WEST OF THE WHITE NILE. (Anglo-Egyptian Sudan Handbook Series, No. 2.) December, 1912. 215 pp. Map. Compiled in the Intelligence Dept., Sudan Govt., Khartoum. $1.25. 8 x 5½.

MANUAL OF EGYPTIAN ARCHAEOLOGY AND GUIDE TO THE STUDY OF ANTIQUITIES IN EGYPT. For the use of students and travellers. By Sir G. Maspero. Translated and enlarged by Agnes S. Johns. 6th English edit. xxii and 385 pp. Ills., index. G. P. Putnam's Sons, New York, 1914. 7½ x 5.

UN FRANÇAIS AU SÉNÉGAL: ABEL JEANDET. Par B. H. Gausseron. xviii and 207 pp. Librairie Ancienne Honoré Champion, Paris, 1913. Fr. 5. 9½ x 6½.

WISSENSCHAFTLICHE ERGEBNISSE der Deutschen Zentral-Afrika-Expedition 1907-1908. Unter Führung Adolf Friedrichs, Herzogs zu Mecklenburg. Vol. 4: Zoologie 2, Lief. 12: Süsswasserschwämme (Spongillidae). pp. 475-485. Vol. 5: Zoologie 3, Lief. 1: Orthoptera. Von James A. G. Rehn. 223 pp.; Lief 2: Fische. Von P. Pappenheim and G. A. Boulenger. pp. 225-260. Ills. Klinkhardt & Biermann, Leipzig, 1914. Mk. 0.60, 8.40, 4.80, respectively. 10½ x 7.

THE GUIDE TO SOUTH AND EAST AFRICA. For the use of Tourists, Sportsmen, Invalids and Settlers. Edited annually by A. Samler Brown and G. Gordon Brown, 1915 edition, for the Union-Castle Mail S. S. Co., Ltd. liv and 694 pp. Maps, index. Sampson Low, Marston & Co., Ltd., London, 1915. 7½ x 5.

GUIDE TO RHODESIA FOR THE USE OF TOURISTS AND SETTLERS. xvi and 395 pp. Maps, ills., index. British South Africa, London, 1914. 2s. 6½ x 4½.

## ASIA

AN ESSAY ON THE CIVILISATIONS OF INDIA, CHINA, JAPAN. By G. Lowes Dickinson. 86 pp. Doubleday, Page & Co., Garden City, New York, 1915. 60 cents. 6½ x 4.

UNKNOWN MONGOLIA. A record of travel and exploration in north-west Mongolia and Dzungaria. By Douglas Carruthers. With three chapters on sport by J. H. Miller. 2nd edit. Vol. 1: xviii and 318 pp. Vol. 2: 659 pp. Maps, ills., index. Hutchinson & Co., London, 1914. 9½ x 6½.

THE GEOLOGY OF CYPRUS. By C. V. Bellamy and A. J. Jukes-Browne. 72 pp. Map, ills. Director of Public Works, Nicosia, 1905. 9½ x 6½.

ECONOMIC CONDITIONS IN THE PHILIPPINES. By Hugo H. Miller assisted by Charles H. Storms. vii and 373 pp. Ills., index. Ginn & Co., Boston, 1913. 8 x 5½.

DE GROTE PROBLEMEN DER KOFFIEKULTUUR [in Dutch East Indies]. Openbare Voordracht gehouden door Dr. Z. Kamerling ter opening zijner lessen aan de Rijks Hoogere, Land-, Tuin- en Boschbouwschool op Woensdag, 14 October 1914. 26 pp. H. Veenman, Wageningen, 1914. 10 x 6½.

## EUROPE

THE UPPER THAMES COUNTRY AND THE SEVERN-AVON PLAIN. By N. E. MacMunn. (Series: The Oxford Geographies. Edited by A. J. Herbertson.) 124 pp. Maps, ills., index. Oxford University Press (Amer. Branch), New York, 1913. 2s. 6d. 7½ x 5½.

DIE RHÖN. EINE MORPHOLOGIE DES GEBIRGES. Von Dr. Bruno Dietrich. 68 pp. Maps, ills. Reprint, *92. Jahresb. der Schlesischen Gesell. für vaterländische Cultur*, Breslau, 1914. 9½ x 6½.

DIE GERMANISCHEN STÄMME und die Kulturen zwischen Oder und Passarge zur römischen Kaiserzeit. Von Erich Blume. 2. Teil: Material. Aus dem Nachlass herausgegeben von Martin Schultze. (Series: Mannus Bibliothek.) xiii and 212 pp. Index. C. Kabitzsch, Würzburg, 1915. Mk. 8. 10½ x 7½.

GRIECHISCHE REISESKIZZEN AUS DEM SOMMER 1912. Von Albert von Berzeviczy. 99 pp. Duncker & Humblot, München, 1914. Mk. 2.50. 10 x 7.

IL LAGO DI GARDA. Monografia Geografica. Di P. Cavallo. 97 pp. Maps. Tipogr. G. Pane, Casale Monf., 1914. L. 1.50. 9½ x 6½.

NUOVO DIZIONARIO DEI COMUNI E FRAZIONI DI COMUNI DEL REGNO D'ITALIA secondo il Censimento 10 Giugno 1911 e i dati ufficiali a tutto Marzo 1914. Di C. Triverio. Elenco delle localita abitate nelle Colonie Italiane, Libia (Cirenaica e Tripolitania), Eritrea, Somalia e localitá d'occupazione temporanea "Isole del Dodecanneso, Rodi." 512 pp. Index. U. Hoepli, Milan, 1915. L. 4.50. 6 x 4½.

ISLANDS GRÖSSTER VULKAN. Die Dyngjufjöll mit der Askja. Von Dr. Hans Spethmann. vi and 143 pp. Ills. Veit & Comp., Leipzig, 1913. 9½ x 6½.

MODERN RUSSIA. By Gregor Alexinsky. Translated by Bernard Miall. 361 pp. Index. Charles Scribner's Sons, New York, 1914. [Reviewed in *Bulletin*, No. 2, 1915, p. 136.] 9 x 6.

### WORLD AND PARTS OF IT

ILLUSTRIERTES JAHRBUCH DER WELTREISEN. 13. Jahrgang, 1914. Von H. Berdrow. 238 pp. Maps, ills. Karl Prochaska, Teschen, 1914. Mk. 1.50. 11½ x 8.

THE BRITISH EMPIRE. Six lectures. By Sir Charles P. Lucas. ix and 250 pp. Maps, index. The Macmillan Co., New York, 1915. 80 cents. 7½ x 5.

DOOR WEST-INDIË. Antillen, Panama, Venezuela, Britsch Guyana, Suriname. Door Dr. C. J. Wijnaendts Francken. 238 pp. Maps, ills., index. H. D. Tjeenk Willink & Zoon, Haarlem, 1915. Fl. 3.25. 9 x 6.

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## CURRENT GEOGRAPHICAL PAPERS

### NORTH AMERICA

**United States.** BEEKLY, A. L. Geology and Coal Resources of North Park, Colorado. 121 pp. Maps, ills., index. *U. S. Geol. Surv. Bull. 596.* 1915.

BIRGE, E. A., AND C. JUDAY. The Inland Lakes of Wisconsin. 137 pp. Maps, index. *Wisconsin Geol. & Nat. Hist. Surv. Bull. No. 27: Sci. Series No. 9.* Madison, Wis., 1914.

BYINGTON, C. A Dictionary of the Choctaw Language. Edited by J. R. Swanton and H. S. Halbert. 611 pp. *Bur. of Amer. Ethnol. Bull. 46.* Washington, 1915.

CLARK, W. O. Ground-Water Resources of the Niles Cone and Adjacent Areas, California. (Contribution to the Hydrology of the United States, 1914-H.) Maps, ills. *U. S. Geol. Surv. Water-Supply Paper 345-H*, pp. 127-168. 1915.

EDMONDS, J. H. The Burgis Views of New York and Boston. 22 pp. Ill. Reprint, *Proc. Ann. Meeting [Bostonian Soc.]*. 1915.

HENSHAW, F. F., G. C. BALDWIN, G. C. STEVENS, AND E. S. FULLER. North Pacific Coast Drainage Basins. (Surface Water Supply of the United States 1911, Part 12.) 706 pp. Maps, index. *U. S. Geol. Surv. Water-Supply Paper 312.* 1915.

HILL, J. M. Some Mining Districts in Northeastern California and Northwestern Nevada. 200 pp. Maps, index. *U. S. Geol. Surv. Bull. 594.* 1915.

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HINTZE, F. F., JR. The Basin and Greybull Oil and Gas Fields, Bighorn County, Wyoming. 62 pp. Maps, ills. *Wyoming Geologist's Office Bull. No. 10.* Cheyenne, 1915.

HOTCHKISS, W. O., AND E. STEIDTMANN. Limestone Road Materials of Wisconsin. 137 pp. Maps, ills. *Wisconsin Geol. & Nat. Hist. Surv. Bull. No. 34: Econ. Series No. 16.* Madison, 1914.

HOYT, W. G., AND H. J. RYAN. Gazetteer of Surface Waters of Iowa. (Contributions to the Hydrology of the United States, 1914-I.) *U. S. Geol. Surv. Water-Supply Paper 345-I,* pp. 169-225. 1915.

JAENICKE, A. J., AND M. H. FOERSTER. The Influence of a Western Yellow Pine Forest on the Accumulation and Melting of Snow. Ills. *Monthly Weather Rev.,* Vol. 43, 1915, No. 3, pp. 115-126.

JOHNSON, D. W., AND W. S. SMITH. Wave Work on the New Jersey Coast. Ills. *Pop. Sci. Monthly,* Vol. 86, 1915, No. 6, pp. 557-567.

JONES, L. A., W. J. SCHLICK, AND C. E. RAMSER. A Report on the Methods and Cost of Reclaiming the Overflowed Lands along the Big Black River, Mississippi. 39 pp. Maps, diagrams. *U. S. Dept. of Agric. Bull. No. 181.* 1915.

KINCER, J. B. A Correlation of Weather Conditions and Production of Cotton in Texas. Diagrams. *Monthly Weather Rev.,* Vol. 43, 1915, No. 2, pp. 61-65.

KIPP, H. A., A. G. HALL, AND S. W. FRESCOLN. The Drainage of Jefferson County, Texas. 40 pp. Maps. *U. S. Dept. of Agric. Bull. No. 193.* 1915.

KREBS, C. E., AND D. D. TEETS, JR. Boone County. 648 pp. Ills., index, maps in separate case. *West Virginia Geol. Surv. County Repts. 1915.* Morgantown.

LATIMER, W. J. Soil Survey of Boone County, West Virginia. 26 pp. Maps. *Advance Sheets, Field Operations of the Bureau of Soils, 1913.* 1915.

LATIMER, W. J. Soil Survey of Logan and Mingo Counties, West Virginia. 30 pp. Map. *Advance Sheets, Field Operations of the Bureau of Soils, 1913.* 1915.

LEWIS, J. V., AND H. B. KÜMMEL. The Geology of New Jersey: A summary to accompany the Geologic Map (1910-12) on the scale of 1:250,000. 147 pp. Maps, index. *Geol. Surv. of New Jersey Bull. 14.* [Trenton], 1915.

MCCRORY, S. H., O. G. BAXTER, D. L. YARNELL, L. A. JONES, AND W. J. SCHLICK. Report upon the Cypress Creek Drainage District, Desha and Chicot Counties, Arkansas. 20 pp. Maps. *U. S. Dept. of Agric. Bull. No. 198.* 1915.

MCGLASHAN, H. D., AND G. C. STEVENS. Pacific Coast Basins in California. (Surface Water Supply of the United States, 1911, Part 11.) 442 pp. *U. S. Geol. Surv. Water-Supply Paper 311.* 1915.

MCLEAN, F. T. Relation of Climate to Plant Growth in Maryland. Diagrams. *Monthly Weather Rev.,* Vol. 43, 1915, No. 2, pp. 65-72.

MARSHALL, R. B. Results of Spirit Leveling in Idaho 1896 to 1914, Inclusive. 130 pp. Index. *U. S. Geol. Surv. Bull. 567.* 1915.

MARSHALL, R. B. Results of Spirit Leveling in Minnesota 1897 to 1914, Inclusive. 190 pp. Index. *U. S. Geol. Surv. Bull. 560.* 1915.

RUNNER, J. J. Impressions of the Badlands. Ills. *Pahasapa Quarterly,* June, 1915, pp. 9-21. South Dakota School of Mines, Rapid City.

SCHOFF, W. H. The Ohio River: Its Canalization by the Government for Commercial Traffic, etc. Ills. *Commerc. Amer.,* Vol. 11, 1915, No. 11, pp. 13-21. Philadelphia.

SCHRADER, F. C. Mineral Deposits of the Santa Rita and Patagonia Mountains, Arizona. 373 pp. Maps, ills., index. *U. S. Geol. Surv. Bull. 582.* 1915.

SCHRABISCH, M. Indian Habitations in Sussex County, New Jersey. Map, ills., index. *Geol. Surv. of New Jersey Bull. 13,* pp. 1-73. [Trenton], 1915.

SPIER, L. Indian Remains near Plainfield, Union County, and Along the Lower Delaware Valley. Map, index. *Geol. Surv. of New Jersey Bull. 13,* pp. 77-107. [Trenton], 1915.

WEGEMANN, C. H. The Coalville Coal Field, Utah. Map, ills., index. (Contributions to Economic Geology, 1913, Part II-E.) *U. S. Geol. Surv. Bull. 581-E,* pp. 161-187. Washington, 1915.

WILDER, H. J. Soils of Massachusetts and Connecticut with Especial Reference to Apples and Peaches. 73 pp. Map, ills. *U. S. Dept. of Agric. Bull. No. 140.* 1915.

WOOD, B. D. Colorado River Basin. (Stream-Gaging Stations and Publications Relating to Water Resources 1885-1913, Part 9.) *U. S. Geol. Surv. Water-Supply Paper 340-I,* pp. 105-116. 1915.

WOOD, B. D. The Great Basin. (Stream-Gaging Stations and Publications Relating to Water Resources 1885-1913, Part 10.) *U. S. Geol. Surv. Water-Supply Paper 340-J,* pp. 117-129. 1915.

WOOD, B. D. Western Gulf of Mexico Drainage Basins. (Stream-Gaging Stations and Publications Relating to Water Resources 1885-1913, Part 8.) *U. S. Geol. Surv. Water-Supply Paper 340-H,* pp. 95-104. 1915.

—— Assessed Valuation of Property and Amounts and Rates of Levy, 1860-1912. 176 pp. Bur. of the Census, Washington, 1915.

—— Charlotte-Hafen und Boca Grande [Florida]. *Annal. der Hydrogr. & Marit. Meteorol.,* Vol. 34, 1915, No. 5, pp. 226-229.

—— Clay and Clay Products [of Pennsylvania], 1911. 51 pp. *Topogr. & Geol. Surv. of Pennsylvania Rept. No. 8c.* Harrisburg.

—— Decisions of the U. S. Geographic Board, March 3 and April 7, 1915. 5 pp.

—— Estimated Valuation of National Wealth, 1850-1912. 20 pp. Bur. of the Census, Washington, 1915.

—— Report for 1913 on the Trade and Commerce of the Consular District of Galveston. 41 pp. Map. *Diplomatic & Consular Repts. Ann. Series No. 5434.* London, 1915.

—— Report for 1913 on the Trade and Commerce of the Consular District of New Orleans. 35 pp. Map. *Diplomatic & Consular Repts., Ann. Series No. 5443.* London, 1915.

—— Report of the Department of Forestry of the State of Pennsylvania for 1912-1913. 493 pp. Ills., index. Harrisburg, 1915.

—— Statistical Abstract of the United States, 1914. 720 pp. Index. Bur. of Foreign and Domestic Commerce, Washington, 1915.

—— 7th Annual Convention of the Atlantic Deeper Waterways Association held at New York with sessions at Perth Amboy, N. J., Newburgh, N. Y., Poughkeepsie, N. Y., Kingston, N. Y., Hudson, N. Y., Albany, N. Y., and Troy, N. Y. Sept. 22-26, 1914. Compiled and edited by W. H. Schoff. 328 pp. Maps, ills., index. Atlantic Deeper Waterways Assoc., Philadelphia, 1915.

—— 19th Biennial Report of the Kansas State Board of Agriculture for 1913 and 1914. 1024 pp. Ills., index. Topeka, 1915.

**Canada.** ADAMS, F. D. The National Domain in Canada and Its Proper Conservation. (Presidential Address before the Royal Society of Canada, 1914.) 48 pp. Maps, ills. Commission of Conservation, Ottawa, 1915.

DOWLING, D. B. Coal Fields and Coal Resources of Canada. 174 pp. Maps, index. *Canada Geol. Surv. Mem. 59: Geol. Series No. 55.* Ottawa, 1915.

GOLDTHWAIT, J. W. The Occurrence of Glacial Drift on the Magdalen Islands. 11 pp. Map, ills. *Canada Geol. Surv. Mus. Bull. No. 14: Geol. Series No. 25.* Ottawa, 1915.

RADIN, P. The Social Organization of the Winnebago Indians, an Interpretation. 40 pp. *Canada Geol. Surv. Mus. Bull. No. 10: Anthrop. Series No. 5.* Ottawa, 1915.

REINECKE, L. Physiography of the Beaverdell Map-Area and the Southern Part of the Interior Plateaus of British Columbia. 49 pp. Maps, ills. *Canada Geol. Surv. Mus. Bull. No. 11: Geol. Series No. 23.* Ottawa, 1915.

TYRRELL, J. B. Algonquian Indian Names of Places in Northern Canada. Reprint, *Trans. Roy. Canadian Inst.,* Vol. 10, 1914, pp. 213-231. Toronto, 1915.

TYRRELL, J. B. The Occurrence of Gold in Ontario. Reprint, *Trans. Inst. of Mining & Metallurgy,* Vol. 23, 1913-14, pp. 143-162. London.

—— Report on Immigration for 1914. 199 pp. Ills. Part 2 of the *Ann. Rept., Dept. of the Interior, 1914 (Sess. Paper No. 25, A. 1915).* Ottawa.

**Mexico.** WAITZ, P. Der gegenwärtige Stand der mexikanischen Vulkane und die letzte Eruption. *Zeitschr. für Vulkanologie,* Vol. 1, 1914-15, No. 4, pp. 225-274. D. Reimer (E. Vohsen), Berlin.

XUM

## SOUTH AMERICA

EDWARDS, H. A. Further Frontier Work on the Bolivia-Brazil Northern Boundary. Map. *Geogr. Journ.*, Vol. 45, 1915, No. 5, pp. 384-405.

**British Guiana.** EGERTON, W. A Railway and Hinterland Development. Ills. *Timehri (Journ. Roy. Agric. and Commerc. Soc. of British Guiana)*, 3rd Series, Vol. 3, 1015, No. 2, pp. 159-167. Demerara.

## AFRICA

BARTOLOTTI, D. Politica commerciale francese in Algeria e Tunisia. *L'Africa Ital.*, Vol. 34, 1915, Fasc. 4, pp. 95-103. Naples.

BONNIN, R. Les colonies allemandes en Afrique. Map, ills. *La Nature*, No. 2174, 1915, pp. 345-350. Paris.

UHLIG, C. Der südafrikanische Bundesstaat und Deutsch-Südwestafrika. *Geogr. Zeitschr.*, Vol. 21, 1915, No. 4, pp. 198-226.

**Algeria.** —— Report for 1913 on the Trade of Algeria. 68 pp. Map. *Diplomatic & Consular Repts. Ann. Series No. 5444.* London, 1915.

**Egypt.** DEHÉRAIN, H. Un officier de l'armée d'Egypte, Théviôtte, et son œuvre géographique. [Théviôtte's studies of Egypt were made in the last years of the eighteenth century.] *La Géogr.*, Vol. 30, 1914-15, No. 3, pp. 182-200.

HOGARTH, D. G. Alexander in Egypt and Some Consequences. *Journ. Egyptian Archæol.*, Vol. 2, 1915, Part 2, pp. 53-60. London.

**German East Africa.** STERN, —. Aus Unyamwesi und seiner alten Zeit. Aus der Geschichte für die Geschichte. *Mitt. Geogr. Gesell. zu Jena*, Vol. 32, 1914, pp. 129-146.

—— Report for the Years 1912-13 on the Trade, Commerce and Economic Position of German East Africa. 50 pp. Map. *Diplomatic & Consular Repts. Ann. Series No. 5441.* London, 1915.

**Kamerun.** BRIESEN, VON —. Beiträge zur Geschichte des Lamidats Ngaundere. *Mitt. aus den Deutschen Schutzgeb.*, Vol. 27, 1914, No. 4, pp. 349-359.

**Liberia.** ELLIS, G. W. Sociological Appraisement of Liberian Resources. *Journ. of Race Develop.*, Vol. 5, 1915, No. 4, pp. 399-415.

**Sahara.** CHUDEAU, R. L'Igidi. *La Géogr.*, Vol. 30, 1914-15, No. 3, pp. 201-206.

**Tunis.** —— Report for 1913 on the Trade of the Regency of Tunis. 41 pp. Map. *Diplomatic & Consular Repts. Ann. Series No. 5431.* London, 1915.

## ASIA

**China.** HEINTZLEMAN, P. S. Manchuria [trade in 1914]. 39 pp. Supplement to *Commerce Repts., Ann. Series, 1915, No. 52b.* Washington, D. C.

—— List of Lighthouses, Light-Vessels, Buoys, and Beacons on the Coast and Rivers of China, 1915. 65 pp. Map. *China Marit. Customs, Miscell. Series: No. 6.* Shanghai, 1915.

**French Indo-China.** LELIÈVRE, A. E., AND C. A. CLOUQUEUR. Pagode de Dakao. 25 pp. Ills. *Public. de la Soc. des Etudes Indochinoises de Saigon*, 1914.

**India.** BUCK, SIR E. Report on the Control and Utilization of Rivers and Drainage for the Fertilization of Land and Mitigation of Malaria [in India]. *Proceed. of the 3rd All-India Sanitary Conference held at Lucknow, Jan. 12-19, 1914* (Supplement to the *Indian Journ. of Medical Research*), Vol. 2, pp. 12-19. Calcutta, 1915.

KONOW, S. Englands Kolonialpolitik in Indien. *Kolon. Rundschau.*, 1915, No. 3-4, pp. 141-159.

NEOGI, P. Iron in Ancient India. 78 pp. Ills. *Indian Assoc. for the Cultivation of Science, Bull. No. 12.* Calcutta, 1914.

PISCICELLI, M. A Ceylon. Ills. *Boll. Reale Soc. Geogr.*, Serie 5, Vol. 4, 1915, No. 5, pp. 473-512. Rome.

**Japan.** ECKBO, N. B. Forests of Japan. Ills. *Amer. Forestry*, Vol. 21, 1915, No. 6, pp. 693-711.

NEVELLE, E. L. Taiwan (Formosa) [trade in 1914]. 8 pp. Supplement to *Commerce Repts., Ann. Series, 1915, No. 55b.* Washington, D. C.

—— Imperial University of Tokyo Calendar 2573-2574 (1913-1914). 349 pp. Ills. Tokyo.

**Persia.** SYKES, P. M. A Seventh Journey in Persia. Maps, ills. *Geogr. Journ.*, Vol. 45, 1915, No. 5, pp. 357-371.

**Turkey in Asia.** CONNER, J. E. Homer's Troy To-day. Ills. *Natl. Geogr. Mag.*, Vol. 27, 1915, No. 5, pp. 521-532.

## AUSTRALASIA AND OCEANIA

**Australia.** GEE, L. C. E. A Review of Mining Operations in the State of South Australia during the Half-year ended Dec. 31, 1914. 35 pp. Ills. *South Australia Dept. of Mines [Public.] No. 21.* Adelaide, 1915.

WADE, A. The Supposed Oil-bearing Areas of South Australia. 54 pp. Maps, ills. *Geol. Surv. of South Australia Bull. No. 4.* Adelaide, 1915.

**German New Guinea.** MARQUARDSEN, H. Bericht über das meteorologische Beobachtungswesen im Schutzgebiet Deutsch-Neuguinea. *Mitt. aus den Deutschen Schutzgeb.*, Vol. 27, 1914, No. 4, pp. 360-366.

**Hawaiian Islands.** CROSS, W. Lavas of Hawaii and Their Relations. 97 pp. Map, diagram, index. *U. S. Geol. Surv. Prof. Paper 88.* 1915.

## EUROPE

BRAUN, F. Zum Kampfe um die Meerengen [Constantinople]. *Geogr. Zeitschr.*, Vol. 21, 1915, No. 4, pp. 195-197.

CORNISH, V. Notes on the Historical and Physical Geography of the Theatres of War. Maps, sections. *Geogr. Journ.*, Vol. 45, 1915, No. 5, pp. 371-384.

DE LAUNAY, L. Les Portes-de-Fer. Ills. *La Nature*, No. 2174, 1915, pp. 350-355. Paris.

DWIGHT, H. G. The Gates to the Black Sea: The Dardanelles, the Bosphorus, and the Sea of Marmora. *Natl. Geogr. Mag.*, Vol. 27, 1915, No. 5, pp. 435-459.

LANGENBECK, [R.]. Bau und Oberflächenformen der Vogesen. *Verhandl. des 19. Deutschen Geographentages zu Strassburg vom 2. bis 7. Juli 1914*, pp. 149-160. D. Reimer (E. Vohsen), Berlin, 1915.

PARTSCH, J. Der karpathische Kriegsschauplatz. *Geogr. Zeitschr.*, Vol. 21, 1915, No. 4, pp. 177-194.

**Austria-Hungary.** LEGER, L. Les Slaves d'Autriche-Hongrie. *La Géogr.*, Vol. 30, 1914-15, No. 3, pp. 161-181.

—— Jahrbuch für Landeskunde von Niederösterreich. Festschrift zur Fünfzigjahrfeier des Vereines [für Landeskunde von Niederösterreich]. Neue Folge, 13. and 14. Jahrgang, 1914 and 1915. 621 pp. Map, ills., index. Vienna.

**Belgium.** GÜNTHER, S. Belgiens Grenzen. *Petermanns Mitt.*, Vol. 61, 1915, May, pp. 169-171.

KELLER, H. Die Überschwemmungen in Flandern. *Petermanns Mitt.*, Vol. 61, 1915, May, pp. 171-175.

RÜHL, A. Antwerpen. 39 pp. Ills. *Meereskunde: Sammlung volkstümlicher Vorträge*, Vol. 9, 1915, No. 5. Berlin.

**British Isles.** ARLDT, T. Wie lange ist Grossbritannien Insel? *Himmel und Erde,* Vol. 27, 1915, No. 4, pp. 133-141. Berlin.

**Bulgaria.** DRONTSCHILOW, K. Beiträge zur Anthropologie der Bulgaren. Ills. *Archiv für Anthropol.,* Vol. 14, 1915, No. 1, pp. 1-76. Braunschweig.

**France.** MACCURDY, G. G. The Cavern of the Three Brothers (Ariege). [New discoveries of work by paleolithic man.] *Science,* No. 1065, Vol. 41, 1915, pp. 782-783.

OSBORNE, J. B. Havre [statistics of commerce, 1914]. Supplement to *Commerce Repts., Ann. Series, 1915, No. 5c,* pp. 1-20. Washington, D. C.

—— Report for 1913 on the Trade, Commerce and Industries of the Consular District of Rouen. 66 pp. Map. *Diplomatic & Consular Repts. Ann. Series No. 5439.* London, 1915.

—— Report for 1913 on the Trade of Saigon. 17 pp. Map. *Diplomatic & Consular Repts. Ann. Series No. 5442.* London, 1915.

**Germany.** DRYGALSKI, E. VON. Die geographischen Grundlagen des Deutschen Reichs. *Internat. Monatssch. für Wissenschaft & Technik,* Vol. 9, 1915, No. 10, pp. 941-954. Berlin.

HALBFASS, W. Die Wasserkräfte des Berg- und Hügellandes in Preussen und benachbarten Staatsgebieten. *Geogr. Zeitschr.,* Vol. 21, 1915, No. 4, pp. 226-231.

**Iceland.** THORODDSEN, T. Japetus Steenstrups rejser og undersøgelser paa Island i aarene 1839-1840. 20 pp. Reprint, *Mindeskrift for Japetus Steenstrup* [*No. IV*]. Copenhagen, 1913.

**Italy.** BUCK, SIR E. Report on the Control and Utilization of Rivers and Drainage for the Fertilization of Land and Mitigation of Malaria [in Italy.] *Proceed. of the 3rd All-India Sanitary Conference held at Lucknow, Jan. 12-19, 1914* (Supplement to the *Indian Journ. of Medical Research*), Vol. 2, pp. 1-11. Calcutta, 1915.

DE FIORE, O. I fenomeni avvenuti a Vulcano (Isole Eolie) del 1890 al 1913. *Zeitschr. für Vulkanologie,* Vol. 1, 1914, No. 2, pp. 57-73. D. Reimer (E. Vohsen), Berlin.

DE FIORE, O. I fenomeni eruttivi avvenuti allo Stromboli dal 1909 al 1914 ed il loro meccanismo. Map, ills. *Zeitschr. für Vulkanologie,* Vol. 1, 1914-15, No. 4, pp. 225-246. D. Reimer (E. Vohsen), Berlin.

DE MAGISTRIS, L. F. Il terremoto marsicano del 13 gennaio 1915. Map. *La Geogr.,* Vol. 3, 1915, No. 1-2, pp. 6-34. Novara.

GORTANI, M., AND A. R. TONIOLO. Per un "Atlante del paesaggio geografico italiano." Communicazione all'VIII Congresso Geografico Italiano di Bari. *La Geogr.,* Vol. 2, 1914, No. 6-7, pp. 202-212. Novara.

PICCIOLI, L. The Present Condition of Forestry in Italy. *Trans. Roy. Scottish Arboricultur. Soc.,* Vol. 29, 1915, Part 1, pp. 62-70. Edinburgh.

**Russia.** —— Report for 1913 on the Trade of the Consular District of Odessa. 84 pp. *Diplomatic & Consular Repts. Ann. Series No. 5436.* London, 1915.

**Spain.** PERRET, F. A. The Volcanic Eruption at Teneriffe in the Autumn of 1909. Map. *Zeitschr. für Vulkanologie,* Vol. 1, 1914-15, No. 1, pp. 20-31. D. Reimer (E. Vohsen), Berlin.

—— Report for 1913 on the Industries and Commerce of Spain. 52 pp. *Diplomatic & Consular Repts. Ann. Series No. 5440.* London, 1915.

**Switzerland.** DU RICHE PRELLER, C. S. The Zonal Basins of Sub-Alpine Switzerland. Diagrams. *Geol. Mag.,* Vol. 2, 1915, No. 5, pp. 215-224. London.

**Turkey in Europe.** GROSVENOR, E. A. Constantinople and Sancta Sophia. Ills. *Natl. Geogr. Mag., Vol.* 27, 1915, No. 5, pp. 459-482.

## WORLD AND PARTS OF IT

ALBES, E. Cane Sugar in Pan America. Ills. *Bull. Pan. Amer. Union*, Vol. 40, 1915, No. 5, pp. 613-643.

BRENNECKE, W. Ozeanographische Arbeiten S. M. S. "Planet" im westlichen Stillen Ozean 1912/13. Map, diagrams. *Annal. der Hydrogr. & Marit. Meteorol.*, Vol. 43, 1915, No. 4, pp. 145-158.

CART, L. Au Sinaï et dans l'Arabie Pétrée. 252 pp. Maps, ills. *Bull. Soc. Neuchatel. de Géogr.*, Vol. 23, 1914.

IM THURN, E. European Influence in the Pacific, 1913-1914. Map. *Geogr. Journ.*, Vol. 45, 1915, No. 4, pp. 301-326.

PENKA, K. Die alten Völker Westeuropas und Nordafrikas. 24 pp. [Published in incomplete form because of the death of the author.] Reprint, *Politisch-Anthropol. Rev.*, Vol. 12, 1913, No. 6. Berlin.

SCHOTT, G., B. SCHULZ, P. PERLEWITZ. Die Forschungsreise S. M. S. "Möwe" in Jahre 1911. (Beobachtungen von Wilhelmshaven nach Deutsch-Südwestafrika . . auf den Forschungsgebieten der Ozeanographie und Meteorologie . . . im Atlantischen Ozean.) 104 pp. Maps, ills. *Aus dem Archiv der Deutschen Seewarte*, Vol. 37, 1914, No. 1. Hamburg, 1914.

—— La guerre dans les possessions allemandes: La version allemande. *Renseign. Colon.*, Vol. 25, 1915, No. 4, pp. 55-71.

—— Sondages exécutés par divers navires anglais. [In the Atlantic, Pacific and Indian Oceans, the Red Sea and the Mediterranean.] *Annales Hydrogr.*, Series 2, 1914, No. 992, pp. 73-123. Service Hydrogr. de la Marine, Paris.

## MATHEMATICAL GEOGRAPHY AND CARTOGRAPHY

HAMMER, E. Die Nomenklatur der theoretischen geographischen Kartographie im Anschluss an den Aufsatz von H. Maurer: Die Definitionen in der Kartenentwurfslehre, usw. Diagrams. *Petermanns Mitt.*, Vol. 61, 1915, March, pp. 95-98, April, pp. 134-137.

KRÜGER, L. Transformation der Koordinaten bei der konformen Doppelprojektion der Erdellipsoids auf die Kugel und die Ebene. 43 pp. *Veröffentl. der Kgl. Preuss. Geod. Inst., Neue Folge, No. 60.* Potsdam, 1914.

REEVES, E. A. Plane-Table Triangulation from One Station Only. Diagrams. *Geogr. Journ.*, Vol. 45, 1915, No. 5, pp. 411-419.

## PHYSICAL GEOGRAPHY

ALMAGIÀ, R. Le frane e il loro studio dal punto di vista geografico. *La Geogr.*, Vol. 2, 1914, No. 6-7, pp. 218-226. Novara.

DAVIS, W. M. Preliminary Report on a Shaler Memorial Study of Coral Reefs. *Nature*, No. 2372, Vol. 95, 1915, pp. 189-191.

GREGORY, J. W. Deserts. *Scott. Geogr. Mag.*, Vol. 31, 1915, No. 5, pp. 241-244.

GREGORY, J. W. The Relative Distribution of Fiords and Volcanoes. Diagrams. *Scott. Geogr. Mag.*, Vol. 31, 1915, No. 5, pp. 257-261.

MEUNIER, S. Observations sur la théorie générale des phénomènes glaciaires et sur les galets striés. *Proc. Acad. of Nat. Sci. of Philadelphia*, Vol. 67, 1915, Part 1, pp. 2-24.

## METEOROLOGY AND CLIMATOLOGY

BASCHIN, O. Meteorologie und Kriegführung. *Die Naturwissenschaften*, Vol. 3, 1915, No. 19, pp. 242-246. Berlin.

HUMPHREYS, W. J. Huntington on the Climatic Factor. *Monthly Weather Rev.*, Vol. 43, 1915, No. 3, pp. 136-137.

JAEGER, A. Meteorologie in der Schule. 14 pp. Ills. Reprint, *Beihefte zur Zeitschr. Schaffende Arbeit & Kunst in der Schule*, No. 35. Leipzig. No date.

MATTHEW, W. D. Climate and Evolution. Maps. *Annals New York Acad. of Sciences*, Vol. 24, 1915, pp. 171-318.

XUM

SCHMIDT, W. Strahlung und Verdunstung an freien Wasserflächen: Ein Beitrag zum Wärmehaushalt des Weltmeers und zum Wasserhaushalt der Erde. *Annal. der Hydrogr. und Marit. Meteorol.*, Vol. 43, 1915, No. 3, pp. 111-124, No. 4, pp. 169-178.

### PHYTOGEOGRAPHY AND ZOOGEOGRAPHY

SCHRÖTER, C. Le désert et sa végétation. Ills. *Mém. Soc. Friboury. des Sci. Natur., Géol. et Géogr.*, Vol. 5, 1914, No. 4, pp. 127-150.

SOKOLOWSKY, A. Einiges über Robben und ihre Anpassungen an den Wasseraufenthalt. Ills. *Annal. der Hydrogr. & Marit. Meteorol.*, Vol. 34, 1915, No. 5, pp. 208-217.

### ECONOMIC AND COMMERCIAL GEOGRAPHY

BIASUTTI, R. La colonizzazione delle regioni aride. Prolusione al corso di geografia nella R. Università di Napoli (22 Gennaio 1914). *Riv. Geogr. Ital.*, Vol. 22, 1915, Fasc. 2, pp. 57-74, Fasc. 3, pp. 127-137.

MACFARLANE, J. J. Trade and War: Disastrous Commercial Effect of Conflict as Shown by Eight Months' Figures, etc. *Commerc. Amer.*, Vol. 11, 1915, No. 11, pp. 7-11. Philadelphia.

MACFARLANE, J. J. Silk Industry and Trade. Diagram. *Commer. Amer.*, Vol. 11, 1915, No. 10, pp. 7-11.

MARSH, H. Indirect Benefits of Irrigation not Generally Recognized. *Asiatic Review*, Vol. 6, 1915, No. 16, pp. 403-425. London.

SMITH, J. R. Problems in the Geography of Foreign Trade. 10 pp. *Foreign Commerce Courses: Lectures on Exporting.* Educat. Dept., West Side Y. M. C. A., New York, 1915.

VOGEL, W. Die überseeische Geitreideversorgung der Welt. 40 pp. *Meereskunde: Sammlung volkstümlicher Vorträge*, Vol. 9, 1915, No. 4. Berlin.

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## NEW MAPS

EDITED BY THE ASSISTANT EDITOR

*For system of listing maps see p. 75 of this volume*

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. GEOLOGICAL SURVEY

*Topographic Sheets*

*(Including Combined and Special Topographic Maps)*

**California.** (a) Elkhorn Weir Quadrangle. Surveyed in 1905. 1:31,680. 38°45′0″ - 38°37′30″ N.; 121°37′30″ - 121°30′0″ W. Contour interval 5 ft. Edition of June, 1915.

(b) Kern River Oil Field. Surveyed in 1903 and 1904; revised in 1912. 1:12,000. In two sheets: (1) North Sheet. 35°30′0″ - 35°27′30″ N.; 119°2′ - 118°56′ W. (2) South Sheet. 35°27′30″ - 35°25′0″ N.; 119°2′ - 118°56′ W. Interval 20 ft. Edit. of May, 1915.

(c) San Francisco and Vicinity, California. Surveyed in 1892-1913; culture revision in 1913-1914. 1:62,500. 38°10′ - 37°30′ N.; 122°36′ - 122°1′ W. Interval 25 ft. 1915.

(d) Yolo Quad. Surveyed in 1905. 1:31,680. 38°45′0″ - 38°37′30″ N.; 121°52′30″ - 121°45′0″ W. Interval 5 ft. Edit. of June, 1915.

[Maps (a) and (d) belong to the two-inches-to-the mile series covering the northern and central sections of the Great Valley of California. Map (b) is a revised edition of the map originally published in 1906 under the title of

"Oil Center Special Map." Map (c), issued for the Panama-Pacific Exposition (the buildings of which are shown), is a very welcome map showing the whole San Francisco region on one sheet, similar to the special map of the New York City region. It is combined from the San Francisco, Concord, San Mateo and Haywards sheets and portions of the Petaluma, Carquinez and Tamalpais sheets on the same scale. A small area on the northern edge of San Pablo Bay has not yet appeared in this series on so large a scale, the Napa sheet, 1:125,000, heretofore being the only topographic sheet to show it. This area seems to have been adapted from U. S. Coast and Geodetic Chart No. 5,533, 1:40,000. Aside from the value of presenting the whole San Francisco area on one sheet, the map is noteworthy in that the built-up areas of the cities have been brought down to date. What this means in so rapidly developing an area, a comparison with the previous survey (1892-94) will show. San Francisco has spread west to the ocean, particularly north of Golden Gate Park, and south along the line of the Southern Pacific Ry., linking up the formerly isolated suburban towns. On the other hand, the effects of the earthquake fire are visible in the districts southeast of Market Street and north of its lower end, where the former compact masses of buildings have not yet been entirely replaced; only the districts to the north and south of Jefferson Square have retained their former character. Beyond the bay, practically the whole coastal lowland has been occupied, Berkeley having developed remarkably and Richmond having sprung from the ground.]

**Colorado.** (a) Longs Peak Quad.* Surveyed in 1912-1913. 1:125,000. 40°30′ - 40°0′ N.; 106°0′ - 105°30′ W. Interval 50 ft. Edit. of May, 1915.

(b) Soda Canyon Quad. Surveyed in 1911-1912. 1:62,500. 37°15 - 37°0′ N.; 108°30′ - 108°15′ W. Interval 50 ft. Edit. of May, 1915.

[Map (a) contains the northern end of the Front Range (although this name, so important in the orography of the Colorado Rockies, does not appear on the sheet) with Arapaho Peak, Longs Peak, Hagues Peak and Estes Park. The northwestern corner of map (b) has already appeared on the recently issued special map of Mesa Verde National Park in 1:31,250 (listed in the May *Bull.*, p. 395); cliff dwellings are indicated by special symbols.]

**Delaware–Maryland.** Seaford Quad. Surveyed in 1902 and 1911-1912. 1:62,500. 38°45′ - 38°30′ N.; 75°45′ - 75°30′ W. Interval 10 ft. Edit. of May, 1915.

**Indiana–Illinois.** Vincennes Quad. Surveyed in 1911-1913. 1:62,500. 38°45′ - 38°30′ N.; 87°45′ - 87°30′ W. Interval 30 ft. Edit. of May, 1915.

**Illinois.** Ottawa Quad. Surveyed in 1912. 1:62,500. 41°30′ - 41°15′ N.; 89°0′ - 88°45′ W. Interval 20 ft. Edit. of May, 1915.

[A new edition of a sheet first published in 1892. The contrast between the two affords an interesting commentary on the improvements in the surveying methods of the U. S. Geological Survey since that time.]

**Minnesota.** Perham Quad. Surveyed in 1912. 1:62,500. 46°45′ - 46°30′ N.; 95°45′ - 95°30′ W. Interval 10 ft. Edit. of April, 1915.

**Oklahoma.** Hominy Quad. Surveyed in 1911-1912. 1:125,000. 36°30′ - 36°0′ N.; 96°30′ - 96°0′ W. Interval 50 ft. Edit. of May, 1915.

**Pennsylvania–New York–New Jersey.** Milford Quad. Surveyed in 1913. 1:62,500. 41°30′ - 41°15′ N.; 75°0′ - 74°45′ W. Interval 20 ft. Edit. of May, 1915.

**Pennsylvania.** Reading Quad. Surveyed in 1913. 1:62,500. 40°30′ - 40°15′ N.; 76°0′ - 75°45′ W. Interval 20 ft. Edit. of May, 1915.

[This is a new edition of a sheet first published in 1894. Besides illustrating the improvement in surveying methods since that date it affords an interesting index to the economic development of the region.]

**Virginia–Kentucky.** Clintwood Quad. Surveyed in 1912-1913. 1:62,500. 37°15′ - 37°0′ N.; 82°30′ - 82°15′ W. Interval 50 ft. Edit. of May, 1915.

[Co-extensive with the southwestern quarter of the old Grundy, Va.-Ky., sheet, 1:125,000, published in 1892.

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* On these sheets woods are shown in green.

**Washington.** (a) Hoquiam Quad.* Surveyed in 1911-1912. 1:62,500. 47°7′30″ - 46°52′30″ N.; 124°0′ - 123°45′ W. Interval 25 ft. Edit. of May, 1915.

(b) Mt. Baker District. Surveyed in 1907 and 1909. 1:250,000. 49°0′ - 48°30′ N.; 122°0′ - 121°30′ W. Interval 200 ft. Edit. of May, 1915.

(c) Mt. Rainier National Park.* Surveyed in 1910-1911 and 1913. 1:62,500. 47°0.0′ - 46°43.7′ N.; 121°55′ - 121°30′ W. Interval 100 ft. Edit. of May, 1915.

[Map (b), although covering the same area as the neighboring 1:125,000 sheets, is only one-fourth the size of the standard topographic sheet because of its smaller scale. Map (c) is exemplary in its treatment of glacier forms. Blue contours are used; and the relatively large scale of the map and the extent of the glacier area combine to give free play to this expressive method of treatment. The result is a cartographic image of rare beauty which does full justice to the wonderful radial system of glaciers, some of them 5 to 6 miles long, which descend from the mountain on all sides.]

## NORTH AMERICA

### United States

**New York.** The Matthews-Northrup New Map of the City of Buffalo. [1:15,600.] 7 colors. The Matthews-Northrup Works, Buffalo, N. Y., 1909.

[The special merit of this map lies in the fact that it shows the built-up areas. How exceptional a feature this is on an American city map has been dwelt upon before (*Bull.*, Vol. 46, 1914, p. 800), when the collection of maps of American cities received from city engineers was reviewed. Among all those there listed, not one indicated the built-up areas; indeed, the reviewer is familiar with only one official and one private map showing this important feature. Its importance to the geographer is obvious; its usefulness to the general reader also would seem apparent if for no other reason than that, lacking it, a city map falls far short of representing actual conditions, for, after all, a city is mainly an aggregation of houses. The Matthews-Northrup Company is to be congratulated on this innovation; it is not the first sign of progressive spirit on its part.

The built-up areas are indicated in an olive tint. Actual conditions are faithfully portrayed: in the business and industrial districts, where many blocks are compact masses of buildings, the tint covers the whole rectangle; beyond, where the usual type of house arrangement prevails, the tint only borders the rectangle, leaving an inner white space for the "yards," with occasional interruptions for the faithful representation of vacant lots; and, farther out, in the suburbs or else in such residential districts as Delaware Avenue, specks of color, in proper proportional size, indicate the location of single houses. In addition, the map shows the usual elements of city maps, street car lines in red, parks and cemeteries in green, ward boundaries in orange; and such unusual refinements are indicated as overhead and sunken railroad and street car crossings and overhead sections of streets and railroad lines. Unfortunately, no legend enlightens the uninitiated.]

## SOUTH AMERICA

**Brazil.** Map of the Rio Roosevelt from surveys by the Roosevelt-Rondon Expedition, 27th Feb.-30th April, 1914. 1:400,000. 1 color. [In six sections:] I: 10°52′ - 12°2′ S.; 60°27′ - 60°10′ W. II: 9°43′ - 10°52′ S.; 60°34′ - 60°8′ W. III: 8°35′ - 9°43′ S.; 60°45′ - 60°23′ W. IV: 7°26′ - 8°35′ S.; 60°55′ 60°37′ W. V: 6°15′ - 7°26′ S.; 60°42′ - 60°20′ W. VI: 5°6′ - 6°15′ S.; 60°29′ - 60°12′ W. With inset, 1:30,000,000, showing location and arrangement of sections of main map. I color. Accompanies "A Journey in Central Brazil" by T. Roosevelt, *Geogr. Journ.*, Vol. 45, 1915, No. 2, pp. 97-110.

* On these sheets woods are shown in green.

[This is the long-awaited map representing the original survey of the river explored on the Roosevelt-Rondon expedition. A note says that the survey consisted of a compass traverse by Lieutenants J. S. Lyra and Pyrineos de Sousa, supplemented by latitude observations at the points indicated, the whole being adjusted to the astronomically determined position of the starting point of the expedition on the head of the river and the known position of the mouth as determined in 1878 by Commander (now Rear-Admiral) T. O. Selfridge, U. S. N., and laid down on U. S. Hydrographic Office Chart No. 894. The map is a reduction of the original manuscript map on the scale of 1:200,000. Drainage and hydrographic names are in blue, other features are in black. The nomenclature is gratifyingly copious, and the whole survey betokens great care in spite of the difficulties under which it was made. A conception of the river as a whole, which the present sectional map naturally cannot afford, can be gained from the reduction to 1:2,000,000 published in the May *Bulletin* facing p. 362, where further comment will be found, particularly as regards the name of the river.]

## ASIA

**Persia–Afghanistan–Baluchistan, etc.** Southern Asia Series. 1:2,000,000. [Four sheets:] (1) Northern Persia sheet. 40° - 32° N.; 44° - 60° E. 16 colors. 1914. (2) Southern Persia sheet. 32° - 24° N.; 44° - 60° E. 16 colors. 1912. (3) Afghanistan sheet. 40° - 32° N.; 60° - 72° E. 14 colors. 1914. (4) Baluchistan sheet. 32° - 24° N.; 60° - 72° E. 15 colors. 1914. Survey of India, Calcutta.

[These are the first sheets to appear of an admirable physical map of southern Asia whose publication has been begun by the Survey of India. Relief is indicated by hypsometric tints and shading. There is a maximum range of no less than 13 tints on land, ranging from green through yellow and light brown to red brown and red, and 3 for the water, as follows: land, 0,500, 500-1000, 1000-1500, 1500-2000, 2000-3000, 3000-4000, 4000-5000, 5000-6000, 6000-8000, 8000-10,000, 10,000-15,000, 15,000-20,000, and above 20,000 ft.; water, 0-250, 250-500, and below 500 ft. This wide range allows of quite a detailed treatment of relief; nevertheless the color groups are so well chosen that equal justice is done to the broad, general features of the relief. As a consequence, and in view of the relatively large scale, these four sheets doubtless constitute the best extant physical map of the highland of Iran, from Armenia to the Indus and from Mesopotamia to the Hindukush.]

## AUSTRALASIA AND OCEANIA

**German New Guinea.** Durchquerung von Neuguinea im Hinterlande des Hüon-Golfes. Nach dem Reisetagebuch von Missionar G. Pilhofer konstruiert von C. Schmidt. 1:250,000. In two sheets: (1) Nördliches Blatt. 6°36′ - 7°20′ S.; 146°22′ - 147°52′ E. 4 colors. (2) Südliches Blatt. 7°20′ - 8°4′ S.; 146°22′ - 147°52′ E. 5 colors. Accompany, as Taf. 1 and 10, "Eine Durchquerung Neuguineas vom Waria- zum Markhamfluss" by G. Pilhofer, *Petermanns Mitt.*, Vol. 61, I, 1915, Feb., pp. 63-66, and Jan., pp. 21-25, respectively.

[Valuable route survey in the southeastern extremity of Kaiser-Wilhelmsland leading west up the Markham River, which debouches into Huon Gulf, to about 146½° E. and thence southeast and east back to the coast. Drainage in blue; relief in brown shading; author's route in red.]

## EUROPE

**Greece–Albania.** Die Einverleibung des Epirus in Griechenland. Nach griechischen Angaben von Prof. Dr. L. Bürchner. 1:1,500,000. 41⅓° - 38¾° N.; 19° - 21¾° E. Accompanies, as Taf. 17, "Die neue griechisch-albanische Grenze in Nordepirus" by L. Bürchner, *Petermanns Mitt.*, Vol. 61, I, 1915, Feb., p. 67.

XUM

[Shows, in areal coloring, the successive extensions of Greek territory in Epirus after the Treaty of Berlin, 1881, the Treaty of London, 1913, and after the reported recent military occupation by Greek troops of the Argyrokastron district, nominally belonging to Albania since the Treaty of London.]

## Other Maps Received

### NORTH AMERICA

#### United States

**Arizona.** (a) Topographic map of the Santa Rita and Patagonia Mountains, Arizona. 1:125,000.

(b) Geologic map of the Santa Rita and Patagonia Mountains, Arizona. 1:125,000.

Accompany as Pls. I and II, "Mineral Deposits of the Santa Rita and Patagonia Mountains, Ariz.," by Frank C. Shrader, *U. S. Geological Survey, Bull. 582*, Washington, 1915.

**California.** Official railroad map of California. 1:950,400. Railroad Commission of California, San Francisco, 1915.

(a) Map of the drainage basin of Alameda Creek and adjacent areas. 1:250,000.

(b) Map of the Niles Cone and adjacent areas, California. 1:31,250.

Accompany as Pls. IX and X, "Ground-water Resources of the Niles Cone and Adjacent Areas, Cal.," by W. O. Clark, *U. S. Geological Survey, Water-Supply Paper 345-H*, Washington, 1915.

**Missouri.** Base map of Missouri. 1:500,000. Missouri Bureau of Geology and Mines, [Rolla, Mo.], 1914.

**United States.** [Set of 46 state maps, showing counties. Varying scales.] U. S. Department of Agriculture, [Washington], 1914.

Soil provinces and soil regions of the United States. 1:7,000,000. Accompanies "Soils of the United States," by C. F. Marbut, H. H. Bennett, J. E. Lapham and M. H. Lapham, *Bureau of Soils, Bull. No. 96*, Dept. of Agriculture, 1913.

#### Canada

**Alberta.** Map 55A, Geological map of Alberta, Saskatchewan and Manitoba. 1:2,217,600. Geological Survey, Department of Mines, [Ottawa], 1914.

Southern Alberta, showing disposition of lands. 1:792,000. Railway Lands Branch, Department of the Interior, [Ottawa], 1915.

**British Columbia.** Diagram showing the geology of Rainy Hollow, Atlin Mining District, B. C. 1:126,720. Geological Survey, [Ottawa], 1913.

(a) Map 97A. Franklin Mining Camp, B. C. 1:24,000.

(b) Map 133A. Mineral claim, Franklin Mining Camp, West Kootenay, B. C. 1:12,000.

Accompany "Geology of Franklin Mining Camp, B. C.," by C. W. Drysdale. *Mem. 56, Geological Survey, Department of Mines*, Ottawa, 1914.

Pre-emptor's map of British Columbia. 3 mi. to 1 in., 1:190,080. Sheets: 3F, Chilcotin; 3J, North Thompson; 3H, Tête Jaune. Department of Lands, [Victoria], 1915.

Kootenay, Osoyoos & Similkameen, British Columbia, [showing] land recording divisions. 1:500,000. Department of Lands, [Victoria], 1915.

#### Mexico

**Mexico.** Carte du Mexique, par Mr. Niox, Capitaine d'Etat Major. 1:3,000,000. Dépôt de la Guerre, [Paris], 1873.

## CENTRAL AMERICA AND WEST INDIES

**St. Thomas.** Dansk Vestindien, St. Thomas og St. Jan. 1:70,000. Inset: St. Thomas Havn, 1:15,000. [Chart] Nr. 265. Kongelige Sökort-Arkiv, Köbenhavn, 1914.

**San Domingo.** Carte politique de St. Domingue par M. M. Leyritz. 1:640,000. Dépôt de la Guerre, [Service Géographique de l'armée, Paris], 1803.

## SOUTH AMERICA

**Argentine.** Carte générale du Bassin de la Plata, par M. Coffinières, Montevideo, 1850. [1:1,500,000.] Dépôt de la Guerre, [Paris], 1853.

**South America.** Map of South America by Alexander Gross, specially drawn for the South American Year Book. 1:8,000,000. Accompanies "The South American Year Book," Louis Cassier Co., Ltd., London, W. C., 1915.

## AFRICA

**Africa.** Carte de l'Afrique [in 6 sheets]. 1:8,000,000. Service Géographique de l'Armée, [Paris], 1892.

Afrique [in 61 sheets]. 1:2,000,000. Service Géographique de l'Armée, [Paris], 1893.

**Algeria.** Carte de l'Algérie. 1:800,000. [6 sheets]. Service Géographique de l'Armée, [Paris, 1912?].

Territoires du Sud de l'Algérie [in 6 sheets]. 1:100,000. Service Géographique de l'Armée, [Paris, 1908-1909].

Sud Oranais en 4 feuilles. 1:400,000. Dépôt de la Guerre, [Paris], 1855.

Carte provisoire des confins algéro-marocains. 1:200,000. (1) Région de Toulal; (2) Région d'Anoual. [Service Géographique de l'Armée, Paris], 1912.

Carte provisoire des confins algéro-marocains. 1:100,000. [3 sheets]: (1) Région d'El Aïoun Sidi Mellouk; (2) Région de Debdou; (3) Région de Taourirt. [Service Géographique de l'Armée, Paris], 1912.

**Madeira.** General map of the Island of Madeira, constructed by Charles Power from other maps, greatly improved, corrected, and brought up to date, 1914. 1:100,000. George Philip & Son, Ltd., London, 1914.

**Morocco.** Région de Casablanca [in 4 sheets]. 1:100,000. Sheets: 1, Bou Beker; 2, Casablanca; 3, Oulad Saïd; 4, Settat. Service Géographique de l'Armée, [Paris, 1911?].

Chaouïa au 100,000e [in 4 sheets]. [Service Géographique de l'Armée, Paris], 1911.

Environs de Fes. 1:100,000. [Service Géographique de l'Armée, Paris], 1912.

Carte des Etapes [de] Rabat à Fes. 1:500,000. [Service Géographique de l'Armée, Paris], 1911.

Colonnes de Fes, itinéraires au 100,000e. Flle. 1, Mehdia; 2, Oued Beht; 3, Meknes; 4, Fes. Service Géographique de l'Armée, [Paris], 1911.

[Plan of] Meknès-ez-Zitoun au 40,000. Service Géographique de l'Armée, [Paris, 1911].

Région de Mélilla [in two sheets]. 1:100,000. [Service Géographique de l'Armée, Paris, 1911?].

Colonne des Zaïr. 1:100,000. Service Géographique de l'Armée, [Paris], 1910.

Région Mdakra-Zaer, Levés d'itinéraires au 100,000e. Service Géographique de l'Armée, [Paris, 1912?].

Beni Meskine [et] Tadla [in 2 sheets]. 1:200,000. [Service Géographique de l'Armée, Paris], 1910.

2e Itinéraire sur Marrakech. 1:200,000. [Service Géographique de l'Armée, Paris], 1910.

XUM

## ASIA

**Turkey in Asia.** Carte du Liban, d'après les reconnaissances de la Brigade Topographique du Corps Expéditionaire de Syrie en 1860-1861. 1:200,000. Dépôt de la Guerre, [Paris], 1862.

A geological map of Armenia and its border-ranges with indications of minerals and mineral springs, by Felix Oswald, D.Sc., F.G.S. [accompanied by text]. 1:1,013,760. Felix Oswald, Probate Registry, Nottingham, [1914].

Carte du bassin moyen du Yéchil Irmaq, levée et dessinée par G. de Jerphanion. 1:200,000. 4 sheets. Henry Barrère, Paris [1912?].

## EUROPE

**Balkan States.** War map of south central Europe. 1:2,725,000. G. W. Bacon & Co., London, [1915].

[Cartes des] Balkans [en 6 feuilles]. 1:1,000,000. Service Géographique de l'Armée, [Paris, 1899-1900].

**Central Europe.** Oostelijk Operatietooneel. 1:2,250,000. J. Smulders & Co., The Hague, [1914].

Vogelschaukarte [i.e., perspective] des westlichen Kriegsschauplatzes. Art Institut Orell Füssli, Zürich, [1915].

Bacon's picture-map of the western war area. [Approximate scale 1:1,200,000.] G. W. Bacon & Co., Ltd., London, [1915].

Politiken's kort over den østlige krigsskueplads, 1:1,450,000. Politiken's kort over den westlige krigsskueplads, 1:1,200,000. [Politiken's Forlag, Copenhagen, 1915.]

**France.** Carte de la France, [in 59 sheets]. 1:500,000. Service Géographique de l'Armée, [Paris], 1871-1887.

Carte géologique de la France. 1:1,000,000. Ministère des Travaux Publics, [Paris], 1905.

## WORLD AND LARGER PARTS

**World.** Maps showing diplomatic and consular offices of the United States. 20 double-page maps. 9½ x 6½. [Department of State, Washington], 1903.

Bacon's library and commercial route chart of the world. Equatorial scale approximately 1:35,000,000. G. W. Bacon & Co., Ltd., London, [1914?].

## EDUCATIONAL

**Near East.** Wall map of the Near East [in Arabic lettering]. 1:5,000,000. Survey Department, Giza, [1914?].

**Pacific Ocean.** [Wall map of] the Pacific Ocean, [in Arabic lettering, embracing Australia, eastern Asia and western North America]. 1:12,000,000. Survey Department, Giza, [1911?].

**South America.** Wall map of South America [in Arabic lettering]. 1:7,000,000. Survey Department, Giza, 1911.

**World and Continents.** Bacon's wall atlases: (a) The world in hemispheres, 1:39,000,000; (c) Africa, 1:12,500,000. (d) Asia, 1:16,000,000; (e) Australia, 1:4,600,000; (f) Europe, 1:8,000,000; (g) North America, 1:12,500,000; (h) South America, 1:12,500,000. [Each atlas is composed of 7 maps]: (1) [products]; (2) contours; (3) mean annual rainfall; (4) seasonal rainfall; (5) January isotherms; (6) July isotherms; (7) vegetation. G. W. Bacon & Co., Ltd., London, [1914].